# The Oil and Gas Journal

PUBLISHED WEEKLY BY THE
PETROLEUM PUBLISHING COMPANY
211 S. Cheyenne
TULSA, OKLAHOMA



P. C. LAUINGER, *President* — *Editor*, C. O. WILLSON

S. H. ROURKE, *Business Manager* — LYNN M. NICHOLS, *Managing Editor*

M. L. DURHAM, *Circulation Manager* — W. T. ZIEGENHAIN, *Refinery Editor*

W. L. NELSON, *Technical Editor* — W. V. HOWARD, Ph.D., *Field Editor*

HARRY F. SIMONS
*Production Engineering Editor*

*Associate Editors*

H. STANLEY NORMAN — PAUL REED

*District Editors*

NEIL WILLIAMS, Houston, *617 Caroline St.* — F. L. SINGLETON

ROBERT INGRAM, Fort Worth, *Petroleum Bldg.* — CARL HOOT, Tulsa, *211 S. Cheyenne Ave.*

L. P. STOCKMAN, Los Angeles, *Union Oil Bldg.* — HENRY D. RALPH, Washington, *Natl. Press Bldg.*

O. C. PRESSPRICH, Saginaw, *News Bldg.* — TOLBERT R. INGRAM, Denver, *State Office Bldg.*

J. P. O'DONNELL, New York, *415 Lexington Ave.* — A. C. MacINTYRE, Oil City, *Derrick Bldg.*

VICTOR LAURISTON
Chatham, Ontario, *35 Stanley Ave.*

*Advertising*

E. KLAPPENBACH, *Vice President*

KENNETH J. LANGLEY, New York, *415 Lexington Ave.* — HOWARD MARKT, Cleveland, *Leader Bldg.*

C. R. FARMER, Chicago, *105 W. Madison* — MITCHELL TUCKER, Tulsa, *211 S. Cheyenne Ave.*

WAYNE RIVES, Houston, *617 Caroline St.* — J. HOWARD TINKHAM, Los Angeles, *1406 S. Grand Ave.*

A. J. CHAMBERS
Twickenham (Middlesex) England—*72 Cole Park Road*

Member
Audit Bureau of Circulations
Associated Business Papers


# Table of Contents


Vol. 41, No. 20 — September 24, 1942


## News Developments


Trends: Plan Restrictions in Fuel-Oil Use to Supply War Needs ... 51
New Oil-Transportation Era Presaged by Pipe-Line Work ... *Paul Reed* 52
Pipe Lines in War ... *J. R. Parten* 55
Producers Benefit Most From New Preference Order P-98-B ... 57
News From the State Capitals ... 58
Editorial: More Pipe Lines Needed ... 59
Pooling of Products Coming Davies Tells N.P.A. Audience ... *J. P. O'Donnell* 60
Impact of War Keeps Profit Trend of Industry Downward ... *John D. Gill* 61
Military Drain on Manpower May Handicap Oil Industry ... *H. Stanley Norman* 62
Rationing of Fuel Oil May Be Indicative of Acute Shortage ... 67
Cartelization of Eastern Industry Is in Prospect ... *Henry D. Ralph* 68
Peak Demand Expected by California Operators ... *L. P. Stockman* 71
Californians Ask 22-Cent Advance for Heavy Crudes ... 73
Natural Gasoline, Recycling ... 74
Refinery Activity and Expansion ... 220
Pipe-Line Activity ... 222


## Pipe-Line Number


War Has Imposed an Enormous Burden on Nation's Oil Arteries ... *W. Alton Jones* 76
Industry Executives Active in National Pipe-Line Program ... 77
New Practices Improve Crude and Products Line Operation ... *John G. Norton* 78
Practical Suggestions ... 80
Results of Corrosion Inhibitor Demonstrated in Products Line ... *S. S. Smith* 85
Dew-Point Recorder Utilizing Photoelectric Relay Safeguards Natural-Gas Line Against Freezing ... *J. A. Setter* 90
Improved Practices Employed by Humble Pipe-Line System ... *Paul Reed* 92
Property Guard Time Clock ... *F. C. Walters* 94
Suction and Discharge Control of Products Pipe Line ... *J. W. Boyd* 96
War Has Imposed Two-Fold Burden on United States Tanker Fleet ... *J. P. O'Donnell* 98
Methods Used for Dealing With Synchronizing Pump Troubles ... 103
Drip Equipment for Natural-Gas Transmission Lines ... *George Cash* 107
Oklahoma Natural Completes Extension to System ... *C. U. Daniels* 108
Steps in Revamping Pipe Line Serving a Kansas Refinery ... *William Jack* 110
Turbochargers Increase Output of Four-Cycle Diesel Engines ... *J. P. Stewart* 113
Developments in Maintaining Compressor-Station Equipment ... *W. E. Nestor and G. H. McKay* 123
Several Changes in California Lines Expedite War Operations ... 129
Maintenance of Natural-Gas Transmission Lines ... *J. H. Lang* 134
Problems Presented by Water Crossings on Short Line ... 142
Protecting Transmission System Against Surface Subsidence ... *Julian Garrett* 145
Station Operation Departs From Many Customary Practices ... *M. A. Hyde* 155
Centrifugal Pumps Are Widely Used in Pipe-Line System ... *Frank R. Young* 162
Arc Welding Simplifies and Speeds Construction of Pipe Lines ... *C. M. Taylor* 172
Corrosion Coupons and Pipe-Line Predictions ... 174
Standard of Louisiana Has Complete Shop for Maintenance ... *Paul Reed* 178
Methods for Modern Pipe-Line Construction ... 180
Current Developments in Pipe-Line Welding ... *A. N. Kugler* 182
Oil Industry Committees for National Pipe-Line Projects ... 186
Book Reviews: Transactions A.I.M.E.; Handbook Butane-Propane Gases ... 187
Pipe-Line Movement of Oil Increased Rapidly in 1941 ... 188
United Gas Installs Total of 22 Hookups in 19 Hours ... *H. F. Carr* 189
Study of Corrosion Aids in Protection of Pipe Lines ... 191
Old Pipe Used for Gas Line in Coastal Area ... *F. L. Singleton* 204


## Engineering—Operating


The Oxidation of Aliphatic Hydrocarbons (Part 1) ... 207
Glossary of Terms Used in Petroleum Chemistry ... 211
Chemicals From Petroleum ... 211
Refinery Ideas ... 212
Co$t Engineering: Cost of Treating Emulsions ... 213
Co$t Engineering: Selection of Mud Treatment ... 215
Engineering Fundamentals: Heating Value Determination With Calorimeter ... 217


## Field Developments


Field Developments ... 225
Illinois ... 226
Michigan ... *Otto C. Pressprich* 226
California ... *L. P. Stockman* 227
Oklahoma ... *Carl Hoot* 229
Texas Gulf Coast ... *F. L. Singleton* 230
Louisiana Gulf Coast ... *F. L. Singleton* 231
Permian Basin, Panhandle ... *Robert Ingram* 232
Southwest Texas ... *F. L. Singleton* 234
North Central Texas ... *Robert Ingram* 235
Rocky Mountain Area ... *T. R. Ingram* 237
Appalachian Fields ... 238
Kansas, Nebraska ... *Carl Hoot* 239
Canada ... *Victor Lauriston* 240
North Louisiana-Arkansas ... 242
Eastern Texas ... *Robert Ingram* 243
Indiana, Ohio, Kentucky ... 244
Among Drilling Contractors ... 246


## Markets and Prices


Group 3 Market ... 250
New York Market ... 250
A.P.I. Refinery Report ... 250
Gulf Coast Market ... 250
Refinery and Tank-Wagon Prices ... 251
Crude-Oil Prices ... 251


## Additional Features


Personal Paragraphs ... 248
Equipment News ... 252
Classified Advertising ... 254
Advertisers' Index ... 256



Published weekly by The Petroleum Publishing Co., 211 South Cheyenne, Tulsa, Okla. Subscription price, United States and foreign, 1 year, $6.00; 2 years, $10.00; 3 years, $12.00; 5 years, $15.00. Single copies, 20 cents each. Back copies, when over a year old, 50 cents. Changes of address reaching the Tulsa office of the Journal by Saturday take effect with the following issue. Entered as second-class mail matter at Tulsa, Okla., under the Act of March 3, 1879.


*Copyright 1942, by The Petroleum Publishing Company.*

# SOMASTIC

*Laying* **SOMASTIC** *Coated Pipe*

## Permanent Pipe Protection

***To conserve steel...*** **pipe line owners specify *lighter-weight pipe coated with* SOMASTIC *Pipe Coating*, sound engineering by reason of the absolute protection against corrosion loss furnished by this impervious coating.**

**PORTABLE PLANTS**
**AVAILABLE EVERYWHERE**

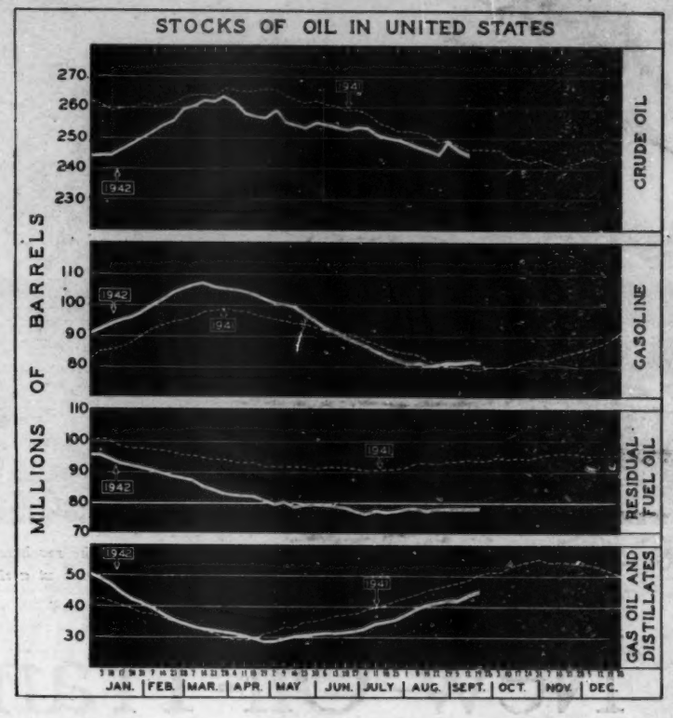
**SOMASTIC**
REG. U.S. PAT. OFF.
**PIPE COATING**

## INDUSTRIAL ENGINEERING CO.

**WILMINGTON, CALIFORNIA, Box 457** **HOUSTON, TEXAS, Box 2091** **BARTLESVILLE, OKLAHOMA, Box 149**

# Trends

## *Plan Restrictions In Fuel Oil Use To Supply War Needs*




THE latest rationing program announced at Washington provides for restrictions in the use of fuel oils in 30 eastern states effective October 15. The general plan calls for a curtailment of 25 per cent with an over-all reduction in demand of 100 million barrels annually. As in the case of gasoline rationing, students of the industry are pointing out that the importance of this program of restrictions in civilian fuel-oil use in relation to present and future demands for petroleum, will be exaggerated unless existing conditions are analyzed. While a shortage of transportation is a factor in the fuel-oil rationing plan, the principal objective is to assure adequate supplies for essential war needs.

A breakdown of the fuel-oil outlets by classes will make the present situation clearer. In 1940, the Bureau of Mines gave the following percentage divisions for 534,007,000 bbl. of distillate and residual fuel-oil consumption: railroads, 12.7; vessels (including tankers), 14; gas and electric power plants, 6.1; manufacturing industries and mines, 13.8; U. S. Army, Navy, Coast Guard, 3.2; oil companies fuel, 9.7; exports, 6.6, and miscellaneous, 1.9. In 1941, the total demands for these oils jumped to approximately 588,000,000 bbl., a gain of 10 per cent and so far in 1942 the demand has been running in excess of 600,000,000 bbl. yearly. Many of these increases are the result of enlarged demands of war activities and these cannot be curtailed. The expanded operations of the armed forces will increase several times the average daily 1940 demand of 47,000 bbl. Many manufacturing and marine outlets increased substantially in 1941 when the defense program got under way and there have been additional increases this year. The

CRUDE PRODUCTION *3,923,950 bbl. daily average—up 15,290 bbl. One year ago 4,062,735 bbl.*

CRUDE STOCKS *244,671,000 bbl. as of Sept. 12—down 2,271,000 bbl. One year ago 246,500,000 bbl.*

GASOLINE STOCKS *80,793,000 bbl. as of Sept. 19—down 965,000 bbl. One year ago 79,195,000 bbl.*

RESIDUAL FUEL-OIL STOCKS *79,335,000 bbl. as of Sept. 19—up 702,000 bbl. One year ago 93,919,000 bbl.*

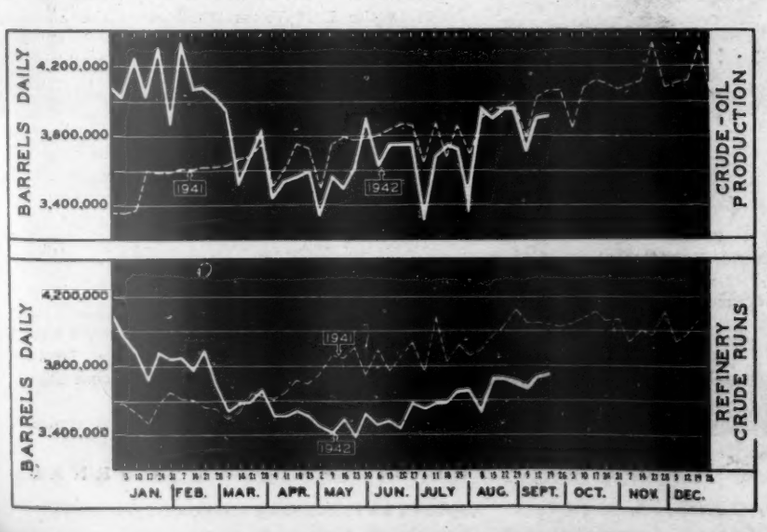
GAS OIL AND DISTILLATES *44,442,000 bbl. as of Sept. 19—up 875,000 bbl. One year ago 50,595,000 bbl.*

REFINERY RUNS *3,713,000 bbl. daily week ended Sept. 19—up 3,000 bbl. One year ago 4,047,000 bbl.*

### *DAILY AVERAGE PRODUCTION FOR WEEK*

| | Sept. 19 crude oil | Sept. OPC quota all oils | Sept. 12 crude oil |
|---|---|---|---|
| Arkansas | 73,350 | 81,900 | 72,500 |
| California | 739,750 | 791,500 | 747,950 |
| Colorado | 7,250 | 7,000 | 6,330 |
| Eastern fields | 95,200 | 109,300 | 97,350 |
| Illinois | 252,200 | 289,200 | 275,920 |
| Indiana | 17,450 | 19,300 | 18,400 |
| Kansas | 301,000 | 291,900 | 272,650 |
| Louisiana | 340,300 | 334,800 | 337,550 |
| *North Louisiana* | *99,900* | | *96,700* |
| *Louisiana Gulf Coast* | *240,400* | | *240,250* |
| Michigan | 62,900 | 66,700 | 65,800 |
| Mississippi | 73,500 | 50,200 | 73,350 |
| Montana | 21,710 | 22,800 | 21,740 |
| Nebraska | 3,450 | 3,900 | 3,300 |
| New Mexico | 98,350 | 98,100 | 98,300 |
| Oklahoma | 370,100 | 415,300 | 375,250 |
| Texas | 1,378,250 | 1,397,800 | 1,355,900 |
| *East Texas* | *362,400* | | *362,400* |
| *West Texas* | *212,800* | | *205,600* |
| *North Central Texas* | *136,900* | | *136,600* |
| *East Central Texas* | *85,700* | | *86,200* |
| *Texas Panhandle* | *90,600* | | *90,000* |
| *Texas Gulf Coast* | *423,800* | | *409,100* |
| *Southwest Texas* | *66,050* | | *66,000* |
| Wyoming | 89,190 | 93,400 | 86,570 |
| Total United States | 3,923,950 | 4,073,100 | 3,908,660 |
| Total production, January 1-September 19, 1942 | | | 993,071,060 |
| Same period last year | | | 977,915,155 |

*Texas shutdown days, Sept. 19, 13; preceding week, Sept. 12, 6.*




Government hopes to offset part or all of these essential war needs by restricting civilian use with emphasis placed on oils consumed in homes, offices, hospitals, and other buildings. Government investigations early in the year showed there was a definite limit as to how much this consumption could be curtailed with lower temperatures and conversion to other fuels. Weather conditions will be an important factor in determining what can be done in fuel rationing over the next few months.

In regard to plans for conversion to other fuels investigations have shown that a shift to natural gas is rarely possible because there is a shortage in that fuel in areas where the requirements of war industries have expanded. The use of coal is not practical in most cases and the mining and shipment of coal generally represents a larger drain on manpower and transportation facilities than does the production and distribution of petroleum products.

*Left: Tractors cradling 24-in. pipe ahead of the machine which both coats and wraps the crude-oil line being laid for War Emergency Pipelines, Inc. Right: Dredging operations at a river crossing carried on by Williams Brothers Corp. for the same project*

# New Oil-Transportation Era Presaged by Pipe-Line Work

By PAUL REED

THREE unusual projects at the heart of the national pipe-line program typify present undertakings of distinctly different kinds which are the outcome of steady effort of the petroleum industry and government agencies in recent months to increase the flow of petroleum to the East Coast.

Most spectacular and significant, of course, is the 550-mile, 24-in. crude-oil line of War Emergency Pipelines, Inc., from Texas to Illinois. At the present rate of progress, with favorable weather, it is anticipated that approximately 160 miles will be completed by the end of this week.

Not far from the big line is Project 5, which in normal times would be considered a remarkable enterprise because it entails conversion of a network of major-company crude-oil systems to product service and reversal of flow in these lines as well as in a products line for the purpose of feeding a 10-in. artery between El Dorado and Helena, Ark., now being built of pipe obtained by digging up a line in Texas. The objective of the project is to ship from Gulf Coast refineries to the Mississippi River. But in these times the novelty of Project 5 is obscured by other undertakings.

An extraordinary development this year is the new pressure-welding method employed in looping Texas Pipe Line Co.'s crude-oil line in North Texas and southern Oklahoma, which eliminates use of welding rods and does not demand the services of skilled welders.

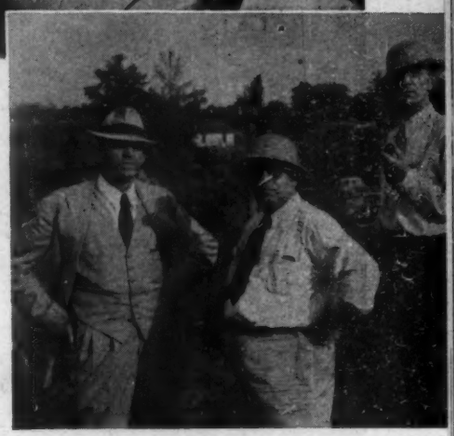
*Adjusting equipment for the new pressure welding method which completes the weld in one operation and eliminates welding rods. Welding is being done by a subsidiary of El Paso Natural Gas Co. for Texas Pipe Line Co. Insert shows appearance of completed weld*

A visit to the several projects now under way leaves a distinct impression that these developments may be regarded ultimately as first steps toward a new era of pipe-line transportation which will make a distinct break with customary practice. For one thing, it appears that, in the future, the tanker program will be built around conditions in which the 24-in. crude line, ultimately to be extended to New York-Philadelphia areas and possibly later parallel crude and products lines, will have a dominating part.

The complex problems connected with revamping the country's pipe-line transportation is currently apparent in the prolonged conferences of recent weeks to decide how to supply sufficient crude to the East Texas terminal of the 24-in. line. After the line is completed to Norris City, Ill., there also will be serious traffic problems connected with transferring shipments to tank cars.

Contact with the War Emergency Pipelines, Inc.'s project either at the headquarters offices in Little Rock, Ark., or in the field with contractors' organizations, gives convincing evidence that there is a prevailing impulse to do the job as efficiently, rapidly and economically as possible as a creditable national achievement. From the start, construction has been pushed aggressively by a corps of executives headed by B. E. Hull, vice president and general manager, whose staff has been drawn from Cities Service, Texas, Humble, Standard of Louisiana, Oklahoma Pipe Line and other organizations.

In the face of all-out effort, which is typical



*Upper left: Stovepiping methods adopted by Oklahoma Contracting Co. for laying 24-in. pipe for War Emergency Pipelines. Pipe is supported quite high above the ditch on heavy skids. Upper right: Pipe gang of Anderson Brothers in an adjacent section of the same project. This contracting firm later changed from the roll welding procedure, followed when this photograph was taken, and it now stovepipes. Officials watching 24-in. pipe being pulled under a railroad: W. R. Finney, advisory committee member; B. E. Hull, vice president and general manager, and A. N. Horne, vice president and general superintendent, War Emergency Pipelines, Inc.*

of the petroleum industry, the obstruction tactics of labor racketeers has brought delays. On different occasions, men employed by contractors have been stopped by armed threats; and there have been threats to the line itself. Since the project is vital in the effort for carrying on the war, many in touch with conditions feel that the project should be entitled to military protection.

Simultaneously, between Northeast Texas and southern Illinois, work is in progress at 10 points. Probably no construction project has ever been carried on at the same time between latitudes so far apart, covering such a variety of climate and terrain. For several weeks, progress has been retarded in the swampy country of Northeast Texas and South Arkansas, where frequent rains make it difficult to lower pipe in the ditch. Recently, rain has interferred with contractors in Illinois. But this week there has been marked improvement in weather conditions. A record for the project was established September 19 when 6½ miles of line were completed.

Certain features are peculiar to this project. Pipe is heavier than any used by the petroleum industry. It is twice the diameter of any major petroleum line in this country. Consequently, there is special need for the largest types of tractors for supporting pipe during coating and wrapping, as well as lowering-in operations. Contractors' organizations report that this heavy pipe does not need to be handled as carefully as the thinner-walled pipe of equal or larger diameter used for natural-gas lines. It can be bent readily by the cold bending method when it is made up in sections. Somewhat more time than usual is required for lining up pipe in clamps with correct spacing. In this operation, it is noticed that much pounding is sometimes required to correct a high-low joint condition when the pipe is egg-shaped.

Roll welding and stovepiping are both being used. It was originally anticipated that all of the line would be laid by the roll-weld method, which consists of welding three or four joints in a section before the pipe is added to the line. However, the impressive results of Oklahoma Contracting Co. with the stovepipe method have brought an inclination to favor this procedure. At present half of the spreads are stovepiping and half of them are roll welding.

Some contractors, continuing to lay pipe by the roll-weld method, point out that the success of the spreads using stovepiping is likely to lead to incorrect conclusions regarding the relative merits of the two techniques.

Before the big line is completed, something will be done to settle the controversies over the advantages and disadvantages of stovepiping large-diameter pipe. C. S. Foreman Co., which did the first stovepiping of 24-in. on a natural-gas line in Kansas in 1940, is roll welding on this job. Anderson Brothers, who started out roll welding, have changed to stovepiping on the section adjoining that of Oklahoma Contracting Co. O. E. Dempsey Construction Co. in southern Arkansas and Williams Brothers in Texas have been contending with rainy, swamp conditions with very nearly the same results. Williams Brothers Corp. has four tractors of the largest size. The largest size tractors have special advantages in muddy ground in connection with painting and wrapping and lowering-in because they are not tipped over by the weight of the pipe. A smaller tractor can be balanced by counterweights, but this extra load makes such a tractor more likely to bog down in wet ground.

At the northern end of the line, Ray L. Smith Construction Co. is stovepiping and Sheehan Pipe Line Construction Co. is roll welding.

*Joint of 10-in. lifted preparatory to cold bending in construction of El Dorado-Helena, Ark., line for Project 5*

### Bending Practices

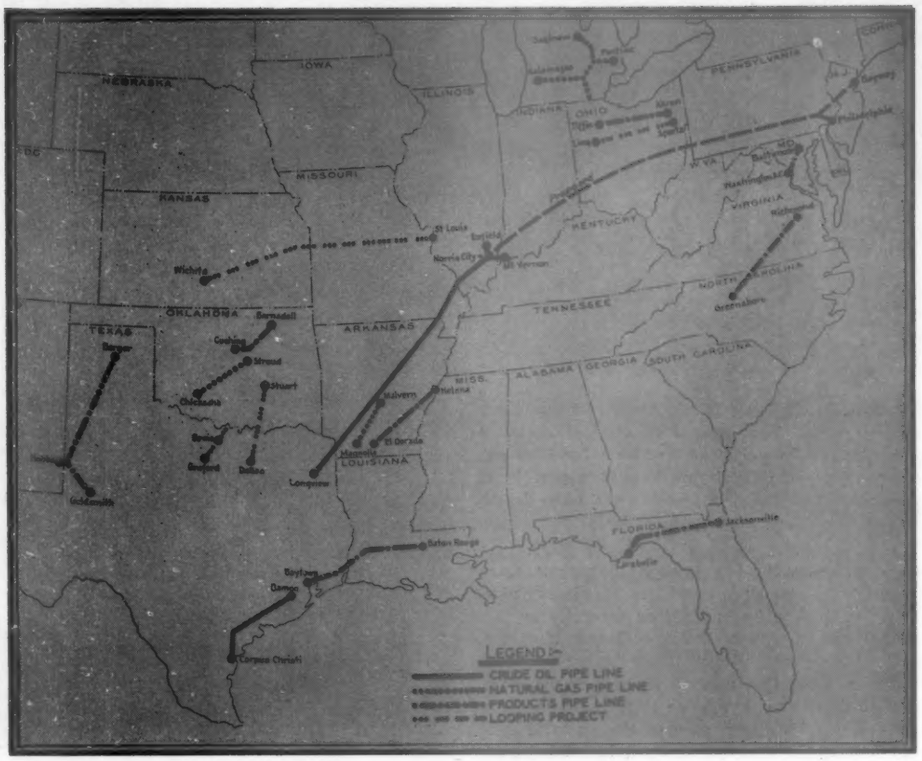
Pipe made up in sections by the roll-welding method is cold bent by two or three tractors, one of which pulls at a shoe placed where the bend is to be made. Hot bending is employed in stovepiping and other operations where single joints must be bent.

The contractor who has been making an exceptional record with the stovepipe method follows a practice of maintaining pipe at a greater height than usual by "skidding up" with heavy timbers like railroad ties. It has been pointed out that this makes it easier for welders to complete their work and it also means that tractors cradling the pipe ahead of the painting and wrapping machine do not need to raise it as much as when it is resting on skids near the ground.

The line is protected for its entire length by Barrett coal-tar pitch enamel applied as a priming coat and immediately followed by wrapping with asbestos felt furnished by Johns-Manville and Philip Carey. Coating and wrapping is done by special equipment made for large-diameter pipe.

The reason for coating and wrapping the pipe for its entire length is said to be the advantage which accrues through higher valuation given to a totally protected line when compared with a bare line or one which is only partially protected. Dealings of major companies in recent years show that, in purchasing pipe in the ground, valuations are sometimes discounted 25 to 50 per cent in cases where the pipe is not entirely protected.

After being with the big-inch project, it is noticed that one soon becomes accustomed to seeing 24-in. pipe so that it no longer seems un-




*Showing principal crude-oil, gasoline, and natural-gas lines of the 1942 construction program*

usually large. But on going to Project 5, the 10-in., which ordinarily seems fairly husky pipe, looks small by comparison. The rapid method adopted on the Williams Brothers' spreads for cold bending pipe of this size demonstrates the advantages of the bending shoe installed in a fixed position under the boom. Pipe is held down by this shoe while an end of the pipe is lifted by cable operated by another boom tractor.

In addition to laying the pipe for Project 5 in Arkansas, Williams Brothers at the same time are digging up this pipe with two of this contractor's gangs engaged in removing the Gulf-Magnolia crude-oil line from Ranger to Panhandle, Tex. Companies participating in Project 5 are: Gulf Refining Co., Socony-Vacuum Oil Co., Inc., Texas Co., Lion Oil Refining Co., and Premier Oil Refining Co. of Texas.

### Pressure Welding Used

Welding of pipe for Texas Pipe Line Co. by the new pressure method is proceeding where W. G. Hanrahan is working north from Dallas and N. A. Saigh Co. is laying between Dennison, Tex., and Durant, Okla. The method consists of placing the two ends of the pipe together under a pressure of from 150 to 450 lb. per sq. in., while the metal is heated to a degree where it becomes soft but does not run. When this condition is reached, a pressure of 750 lb. is applied and the two ends are joined together in the same way that a blacksmith's weld is made. Equipment for this work in the field has been developed by a subsidiary of El Paso Natural Gas Co., known as Pressure Welding Corp., under the direction of A. L. Forbes, Jr., who calls the equipment a "permanent wave" machine because of resemblance which suspended tubing bears to certain beauty-parlor furnishings. The operation of making a weld can be performed in 55 seconds and experience shows that the completion of one weld to the completion of the next may take only 1½ minutes. In the course of a 10-hour day it has been found that 150 welds can be made where no bending is done. The welding of large pipe is said to take very little more time.

On this particular project, Pressure Welding Corp. does all of the bending by the wrinkle-bending method. The welding of Texas Pipe Line Co.'s loops is being handled by Pressure Welding Corp. through arrangements which are separate from the contracts for the rest of the work. Impossibility of obtaining sufficient welding rods meant that this project could not have been undertaken without the pressure-welding process.

Equipment required is installed on a boom tractor towing trailers holding oxygen containers and acetylene generator. It is said that no more than 2 weeks is required for training men to be competent operators. Previous experience with welding is not necessary, although it is possible that it may prove to be of some advantage. Three men handle the operations. Two manipulate torches and have somewhat more responsibility than the third man who drives the tractor and handles valves of hydraulic equipment for holding pipe in the desired position as well as for "endoing" or pushing the joint being added to the line.

Another unusual feature of the project is double coating and double wrapping by special equipment.

What is to be seen on these three projects represents more than mere innovations. The drastic changes brought about by the revamping and extension of old systems for Project 5 illustrate what major companies are doing in forcing old lines to perform functions for which they were never intended. The decision to go straight across country with the 24-in. artery is a daring departure from previous pipe-line customs. Such a means of moving 300,000 to 350,000 bbl. per day eastward may represent the central piece in the transportation picture.

The new welding method may stimulate other improvements or it may represent in itself the process which will have far-reaching effects in making pipe-line construction more efficient and economical.

Obstacles presented by war conditions, including red tape, dislocation of facilities and shortages of critical materials, have not been sufficient to hold back these interesting developments. In fact, they have served as an impetus for departing from customary practices.

THE PRINCIPAL SECTION
of this annual
PIPE-LINE NUMBER
Starts on Page 75

The cover shows construction work by Lone Star Gas Co. near Duncan, Okla. Section index on Page 49.

## Principal 1942 Projects

Pipe lines built for the petroleum and natural-gas industries this year will probably total more than 7,000 miles. About half of this will be crude-oil lines. The mileage of refined-products lines will be about twice that for natural-gas lines.

### Crude-Oil Lines

War Emergency Pipelines, Inc. (Defense Plant Corp. project), 550 miles of 24-in. from Longview, Tex., to Norris City, Ill., with branches to Enfield, Ill., and Mount Vernon, Ind. (Project 9.)

Illinois Pipe Line Co. (Defense Plant Corp. project), 152 miles of 8-in. looping Illinois Pipe Line Co.'s trunk line between Lima and Sparta, Ohio. (Project 1.)

### Proposed Crude-Oil Lines

War Emergency Pipelines, Inc., 1,000 miles of 24-in. from Norris City, Ill., to New York-Philadelphia refining areas. (Project 9.)

Sinclair Refining Co., 245 miles of 8-in. from Corpus Christi to Damon Mound station, Tex.

### Products Lines

Phillips Petroleum Co., 317 miles of 6-in. and 8-in. for looping trunk line between Wichita, Kans., and St. Louis, Mo., and lateral to Kansas City; 237 miles of 8-in. connecting natural-gaso line plants in the Goldsmith, Tex., and Hobbs, N. M., areas with the company's refinery at Borger, Tex.

Bayou Pipe Line Co., 250 miles of 8-in. and 10-in. from the Houston, Tex., refining area to feed Plantation Pipe Line Co. system at Baton Rouge, La. (Project 2.)

Project Five Pipe Line Corp., 158 miles of 10-in. from El Dorado to Helena, Ark. (Project 5.)

### Proposed Products Lines

Plantation Pipe Line Co. (Defense Plant Corp. project), 175 miles of 8-in. from Greensboro, N. C., terminal of Plantation system to Richmond, Va. (Project 2.)

Trans-Florida Pipe Line Corp. (Defense Plant Corp. project to be operated by American Liberty Pipe Line Co.), 185 miles of 8-in. from Carabelle to Jacksonville, Fla.

Ohio Emergency Pipe Line, Inc. (Defense Plant Corp. project), 82 miles of 8-in. from Tiffin to Akron, Ohio, to connect Shell and Standard of Ohio products lines with the Sun-Susquehanna system. (Project 3.)

### Natural-Gas Lines

Panhandle Eastern Pipe Line Co., 235 miles of 12-in. to 20-in., connecting the company's system with Pontiac, Saginaw, and Kalamazoo, Mich.

# PIPE LINES in WAR

By J. R. PARTEN
Director of Transportation, Office of Petroleum Coordinator for War

NEVER again in the history of petroleum transportation by pipe line will there be such a year as 1942.

We are doing things with pipe lines today that we never for a moment imagined we would ever be doing and that we will probably never be called upon to do again. In short, we are making pipe-line history.

We are making that history because there's a war we've got to win, and winning a war requires the doing of unusual things. Such as:

Constructing the biggest oil line ever laid—the 550-mile 24-in. from East Texas to Illinois.

Laying 750 miles of other new lines.

Digging up and relocating 1,100 miles of second-hand pipe.

Reversing and converting 2,600 miles of line.

Increasing capacity of several hundreds of miles of existing pipe lines by adding pump and booster stations.

The successful completion of any single one of these undertakings in a given year would, normally, be a marvelous accomplishment. That we are doing the entire job at one and the same time, and with practically no new tools, is, to put it mildly, little short of phenomenal. And we are doing that job solely as the result of the most amazing Government-industry cooperation ever achieved.

### Cooperative Spirit Gratifying

It has been particularly gratifying to me, in these past few months, to see men of industry and the officials of Government sit down around the conference table and seek together the solution of the many pipe-line problems growing out of the need for increasing the overland delivery of oil to the Atlantic seaboard. The fruits of mutual endeavor are to be seen today on every hand. At great expense, and with much sweat and toil, we are overcoming the problems that face us, and we can and are making our pipe lines do their part towards relieving, to a considerable extent, the deficit of supply in the East.

The phase of our activity which has been the most dramatized in the public mind is, naturally, the construction of the 24-in. line from Longview, Tex., to near Norris City, Ill. Too, it holds the most interest to the pipeliner, for in the building of this line we face a gigantic task, involving not only problems of engineering but complicated questions of supply.

First, however, I should like to emphasize that we still regard the Texas-Illinois line as but the first leg of the Texas-East Coast line long advocated by the Office of Petroleum Coordinator, and, more particularly, by Coordinator Ickes. We are still hopeful that eventually the steel can be spared to continue the project to the seaboard, but that will depend, of course, upon the many competing demands for steel which must be appraised and balanced by the War Production Board. In the meantime, we in the Transportation Division of OPC are continuing our studies of this phase of the undertaking and have estimated that it will require approximately 240,000 tons of steel to complete the line to the New York and Philadelphia refining areas, the approximate center of consumption of the eastern seaboard.

This pipe line, if completed and operated at the delivery rate of 300,000 bbl. of oil per day over its approximate 1,500-mile course, would make a freight delivery of about 65 million ton miles per day. It would do the work of about 150 tank ships of 10,000-deadweight tons in Gulf Coast to East Coast movement under existing conditions. If the capacity of the line were stepped up to 350,000 bbl. of oil per day, which is within feasible limits with the addition of pump stations, tonnage delivery and equivalent tank-ship carrying-capacity saving would be proportionately increased.

### Important Questions Pending

There still remain many important questions to be decided, as is only to be expected. One includes that of actually determining at what capacity the line, if built, should be operated beyond Norris City—at 250,000, 300,000, or 350,000 bbl.? To move 250,000 bbl. daily would, we figure, require the installation of about 11 pump stations. A movement of 300,000 bbl. would require about 16 pump stations, while to move 350,000 bbl. would take approximately 19 stations. Naturally, we are tremendously interested in steel efficiency; in other words, in the barrels of oil that can be delivered per ton of steel consumed. In this connection, our figures indicate that there is a rapid increase in steel efficiency as we go from 250,000 to 350,000 bbl. daily. Actually, the increase is about 40 per cent. Therefore, it is apparent that if we can only work out the supply problem so as to get additional oil in Illinois, the thing to do would be to operate the line at 350,000-bbl. capacity. By so doing we would be delivering the most barrels of oil for the fewest tons of steel.

*Maj. J. R. Parten, director of the transportation division, Office of Petroleum Coordinator and, in private life, president of Woodley Petroleum Co. and chairman of Premier Oil Refining Co. of Texas*

There has not been much public discussion on the problem of supplying crude oil and products in East Texas for movement through the 24-in. line. The emphasis has been more on the toughness of the engineering job with which Burt Hull, manager of War Emergency Pipelines, Inc., is wrestling from his headquarters in Little Rock, Ark. I can assure you, however, that this question of supply is no less difficult or important. It is, in fact, occupying most of our attention right now, and, as well, the industry committees of Districts 1, 2 and 3.

With a majority of East Texas oil now moving North and East and with only about 135,000 bbl. per day moving south, sufficient crude for the big line is not readily available, unless the output of the East Texas field be materially increased. This latter course is considered inadvisable by the authorities best acquainted with East Texas field conditions. Some 67,000 bbl. per day now moving northeast from the East Texas fields by tank car logically should be put into the line, but there appears to be little reason to disturb the present movement of crude oil that is going North and East by pipe line from that field.

Very definitely, certain lines—maybe two or three—are going to have to be reversed out of the Houston and Beaumont-Port Arthur areas. For a starter, at least, it has been recommended that some of those lines which are to be reversed will handle heating oil, for two reasons: The first is that District 1 is short of heating oil and is in need of the product. The second, which must not be overlooked, is that heating oil must be moved from the war products refineries of the Gulf Coast.

### Complex Supply Problem

Of course, the Texas-Illinois line initially is going to draw on East Texas crude for a substantial portion of its supply; in other words, for that quantity of crude which now moves from East Texas by rail to the East, plus as much as possible of East Texas crude that is now moving southwest to the Gulf Coast. The latter necessity complicates our problem. It calls for refinery-schedule adjustments and rearrangement of crude supply in the Houston and Beaumont-Port Arthur areas. Stated another way, it means simply that we must find additional crude supply from some other sources for these refining centers.

At present we have under consideration the construction of a line or lines from the Corpus Christi area to Houston and Beaumont. There are a couple of good reasons why we look to Corpus Christi for this additional supply. First, there are sweet crudes available above local refinery demand. Secondly, Corpus Christi has been deprived largely of its outside transportation for crude oil, and tank-car movement is not as efficient as from other sources.

West Texas, of course, must also be looked to for more crude oil in this program. From this

area we have much available pipe-line capacity. More West Texas crude can flow into the Houston-Beaumont and Port Arthur areas by existing pipe lines. More of this oil could flow into the trunk-line systems through Oklahoma and Kansas for delivery north and east. Too, by existing systems, West Texas oil could move to the Longview vicinity for service of the 24-in. pipe line direct. There are existing facilities for handling North Louisiana crude such as is available to the Longview line, with minor changes.

Although the Texas-Illinois line is being constructed to carry either crude oil or products, it appears to be fairly well established that the line should carry no more than two grades of oil. Obviously, the problems of batching through the 24-in. line are great. Moreover, the amount of tankage required increases materially for each additional grade of oil that must be transported through such a system.

### Stream Division Studied

Although no determination has been made for the initial throughput of this line, it is indicated by studies thus far that the most feasible supply would be about 220,000 bbl. per day of crude oil and 80,000 bbl. per day of heating oil.

The completion date of the line some time ago was set for December. At present about 300 miles of the 24-in. pipe has been delivered on the ground. The mill schedule calls for completion of the pipe production on or about November 1, and present expectancy is good for the attainment of this schedule. As of September 15 the contractors had about 100 miles welded and in the ground and about 25 additional miles welded. The line is being built in eight sections by seven contractors. Some delay was experienced by reason of labor troubles in the two sections of southern Illinois and the one section through Missouri. This difficulty has been overcome apparently. Deliveries of pumping equipment, valves and flanges present the only problem that might delay the scheduled completion. However, every effort possible is being made to forestall any such delay.

Arrangements are being made for transshipment of the volume of oil delivered in southern Illinois through several terminals, including a river loading terminal at Mount Vernon, Ind., six tank-car loading terminals, and a connection with the Illinois Pipe Line Co. system, which will make available other tank-car loading terminals and trunk lines extending eastward out of Illinois and Indiana.

•

## Oil Regulatory Authorities Called to Chicago Meeting Preceding Compact Sessions

All members of the National Conference of Petroleum Regulatory Authorities have been specially urged by Hiram M. Dow, Roswell, N. M., chairman, to attend the third general meeting of the organization at the Palmer House, Chicago, Ill., September 30 and October 1.

The conference precedes the meeting of the Interstate Oil Compact Commission to be held at the same place October 1-3.

Mr. Dow said that the conference will be of particular importance this time in view of oil-regulatory problems which have arisen in connection with the Government's war program.

The program of the Interstate Oil Compact Commission following the conference also includes a number of authoritative speakers on subjects dealing with natural-gas use and conservation.

*The convoyed tanker shown under the protection of one of a United States destroyer's guns and a watchful Navy blimp has little to worry about from enemy submarines. (Official U. S. Navy photograph.)*

# This Week...

**PRODUCTION.**—OPC set October production quota for the country at 4,066,200 bbl. daily, for all liquid petroleum; off 6,900 bbl. from the revised September figure, 200,000 bbl. less than actual output a year ago. . . . Illinois, unable to make recent quotas, dropped 9,200 bbl., Texas and New Mexico raised. . . . OPC considering methods for limiting drilling in areas inaccessible to transportation. Stimulation sought elsewhere. . . . Producing branch chief benefactor under P-98-B. Producers can use ratings A-1-a and A-2 for capital items, as well as for repair, maintenance, and operating supplies. . . .

**REFINING.**—Allied demand eventually to exceed 100-octane capacity of all plants now operating, under construction and authorized. . . . Manufacturers urged to make maximum plant conversion to war production, virtually promised continuing demand for products. . . . Critical shortages of fuel oil anticipated next year by OPC. . . . Isobutylene probably most intensively sought fraction. Its flexibility attractive. Currently valuable to aviation-gasoline program, later use in butyl and flexon rubber assures continuing market. . . .

**MARKETS.**—Gasoline demand declining, in most areas. But, increased fuel consumption is sustaining all oil requirements. . . . Prices steady in most parts of country, except Pacific Coast. . . . Refiners and distributors of fuel hold quotations firmly against OPA ceilings. . . . Crude buyers seek more oil in Middle West, where supplies are steadily lagging behind refinery runs. . . . Oil securities show more resistance. Record for 30 stocks in week ended September 18: High, 23.07; low, 22.44; close, 22.93. . . .

**TRANSPORTATION.**—Subcommittee inferentially approves Corpus Christi-Houston, Tex., pipe-line link. Financing, determination of size, arrangements for second-hand pipe, crude supplies left to general District 3 committee for decision. . . . More than 160 miles of 24-in. line laid, out of total of 550. Pipe deliveries comfortably ahead of construction. . . . Defense Plant Corp. agrees to finance and own Plantation Pipe Line Co. extension to near Richmond, Va. . . . New record established for rail movement of oil to East Coast, hit peak of 838,440 bbl. daily. . . . ODT restrictions on short hauls, divert 8,400 tank cars to eastern service, more to follow. . . .

**SUPPLY.**—Negotiations partially complete, and continuing, for pooling of eastern products and distribution facilities. OPC, as sponsor, foresees more efficient supply service, less maladjustment between individual companies. Question of retaining brand identities unsettled, but likely to disappear; following British system instituted at war's outbreak. . . . Common use of terminal facilities certain. Would speed tank-car turnarounds, knit highway transport more firmly into local distribution picture. . . . Drive to lower fuel-oil consumption in District 2 opens with mass meeting of suppliers September 25. Aim to save 20 million barrels of residual, 2.5 million of domestic heating oils. . . .

**RATIONING.**—Date for nation-wide effectiveness uncertain. OPA shooting at November 15; but, much preliminary work unfinished. Instructions awaited from Rubber Administrator Jeffers which are expected shortly. . . .

**PRIORITIES.**—OPC and WPB's control over capital investments made complete in refining, transportation, and marketing, by prohibiting use of A-1-a and A-2 ratings in P-98-B for other than repair, maintenance, and operating supplies. By forcing Washington clearance of investment applications general program may be more completely correlated. Analysis shows no other substantial change from previous P-98. . . .

# Producers Benefit Most From New Preference Order P-98-B

THE priority position of the petroleum industry has been altered only slightly by Preference Rating Order P-98-B, it was indicated this week from experience in the practical application of the new regulation and by further analyses of its language. The new P-98-B, issued September 15, was published in full in the September 17 issue of The Oil and Gas Journal, Pages 12 and 29.

The major change from the previous P-98 order is the abolishment of preference-extension privileges for capital materials to all operating branches of the industry, except producers. The refining, transportation and marketing branches of the industry are privileged to extend ratings sanctioned by P-98-B only to repair, maintenance and operating supplies. Only the production division is permitted to extend P-98-B ratings for investment supplies in addition to materials for maintenance, repair and operations.

First impression of P-98-B among operators that the Office of Petroleum Coordinator and other government agencies might use their arbitrary jurisdiction over high-preference materials to force selective drilling has been discounted.

Reports from Washington, D. C., this week indicate that OPC is considering measures to limit drilling in fields remote from transportation in favor of development in those more accessible to consumers. However, any move to adjust exploitation on a basis of available transportation facilities probably will be through an amendment to the M-68 spacing order, rather than through P-98-B.

### Paper Work Reduced

The first tangible result of P-98-B on the operations of the OPC Washington office was to materially reduce the amount of paper work there because most applications for priority assistance are now cleared through district offices. This result, operators in the oil-producing states were prompt to admit, tends to bring the priority machinery closer to their business.

The assigned ratings of A-1-a and A-2, the only two specifically extendible by P-98-B, are considerably higher than the old A-8 classification for most operating supplies. However, the recent addition of a series of AA ratings, created by WPB to break the jam on military materials, decreased the relative value of the old ratings. However, A-1-a is high enough to get steel from warehouses and also to obtain copper, brass, rubber and most other materials required in oil operations.

Before an A-1-a rating can be applied to an item costing $500 or more, the operator must obtain the authorization of the director general of operations, War Production Board, Washington, D. C., acting through OPC. Authority to apply Preference Rating A-1-a and all communications regarding materials under P-98-B requiring the higher priority classification and valued above $500 should be sought from the Office of Petroleum Coordinator, South Interior Building, Washington, Reference P-98-B. Canadian operators should address their communications to the Office of the Oil Controller, Dominion of Canada, Reference P-98-B.

Materials costing less than $500 and otherwise qualifying for A-1-a preference rating may be authorized by OPC district directors at the following points:

District 1: 122 East Forty-second Street, Chanin Building, New York.

District 2: Suite 1336, 120 South La Salle Street, Chicago, Ill.

District 3: 245 Mellie Esperson Building, Houston, Tex.

District 4: 320 First National Bank Building, Denver, Colo.

District 5: 855 Subway Terminal Building, 417 South Hill Street, Los Angeles, Calif.

In applying for an A-1-a rating, regardless of cost, a letter giving information as follows, must accompany the operator's purchase order:

1. Date of actual breakdown or suspension of operation and exact explanation as to what extent operations are affected (if applicable).

2. The equipment to be repaired and its function in maintaining continuous operations (if applicable).

3. Price, quantity, approximate weight, and detailed description of materials necessary to effectuate the repair or to initiate or maintain operations.

4. A general description of the metals contained in the material applied for and the full justification as to necessity for any material containing metal adjudged critical by the War Production Board. Such metals include copper, nickel, chromium, tin, zinc, aluminum, and molybdenum.

5. The supply if any, of the necessary material which the operator has on hand.

6. Name and address of the supplier, or suppliers, from whom the material is to be obtained. The earliest delivery date assured on an A-2 rating and an A-1-a rating to obtain delivery of the minimum necessary quantity of materials.

Before the A-2 rating can be applied to an item costing $500 or more, the operator must obtain the countersignature of the district director of a district office of the petroleum coordinator. If the cost of the item is less than $500, no countersignature is required.

## Californians Penalized For Violating Spacing Order

Two California oil-well operators last week were penalized for violation of priorities regulations in suspension orders announced by the director general for operations.

The operators are charged in Suspension Orders S-95 and S-96, with using scarce materials to drill oil wells which did not conform to the required uniform-spacing pattern of not more than one well to each 40 surface acres prescribed in Order M-68. The alleged violations were in the Huntington Beach and Torrance fields.

Neither operator may produce oil from the well which he drilled illegally during 60 days of the 90-day period beginning September 14. Withdrawal is permitted during 30 days of the penalty period in order to maintain the wells in operating condition. At the end of 90 days the wells are to be operated only according to conditions prescribed by the director general for operations.

## OPC Subdistricts Organized

**WASHINGTON, D. C. — Subdistrict offices at Tulsa, Pittsburgh, Pa., and Seattle, Wash., will be opened by the Petroleum Coordinator at an early date. The first subdistrict office was opened last week at Boston, Mass., under the direction of Robert J. Hull.**

**Directors for the subdistrict offices at Tulsa and Pittsburgh have not been appointed nor has there been an opening date specified.**

**Homer Britzman, assistant director of marketing in District 5, has been appointed manager of the Seattle office. Each of the subdistrict offices will have 10 or 12 employes with authority to pass on P-98-B applications and other matters, it was understood here.**

**The Pittsburgh office will serve as a branch both of Districts 1 and 2.**

## Revised PD-200 Now Required For New Construction Supplies

WASHINGTON, D. C.—A revised project application form PD-200, which is to be used for obtaining priority assistance and authority to begin installation for most construction items and equipment, is now available for use, the War Production Board announced last week. This form must now be used as an application for authority to begin construction pursuant to the provisions of Order L-41; priority assistance for any project involving new construction, reconstruction, remodeling or conversion, and for priority assistance for equipment when construction is involved.

PD-1-A applications formerly submitted for such equipment will no longer be accepted. When no construction is involved, however, PD-1A's will continue to be accepted for equipment.

The form is now used in other than "command" construction. To reduce delays in processing, the PD-200 form has been correlated with the utilities application for utilities work in connection with a construction project.

Machinery and equipment required for a project have been separated from the construction materials and are listed in new sections. The machinery section has been divided among metalworking equipment, power equipment and other machinery and equipment. The materials list has been increased.

In cases where structural steel is used, a certificate must be attached to PD-200 stating that WPB emergency specifications have been complied with.

# STATE CAPITALS...

## TEXAS

DAILY PRODUCTION of 1,455,261 bbl. in October was authorized in an order issued this week by the Railroad Commission which, making allowance for condensate and natural-gasoline yields, corresponds exactly with the OPC certified quota. Nine general shutdown days were provided on October 3, 4, 10, 11, 17, 18, 24, 25, and 31, except for specified fields in Districts 2, 3, 4, and 9.

The new order made no change in the policy of assigning allowables to individual wells, leaving the question of lease allocations open for further discussion.

PURCHASERS NOMINATED daily requirements for 1,555,945 bbl. of crude oil in October at last week's monthly proration hearing. The October nominations were 8,292 bbl. per day higher than purchasers had requested in September.

Projected requirements of Texas' crude-oil purchasers for the next 6 months indicates a slight recession in demand during the winter months. The lowest nomination of purchasers was submitted for November when buyers said they would need 1,529,002 bbl. of oil. Nominations for the following 4 months were: December, 1,535,219 bbl.; January 1,535,251; February, 1,536,625, and March, 1,536,612 bbl. daily.

Most operators attending the September 17 state-wide hearing favored the proposal that allowables be assigned on a lease basis in the future rather than as to individual wells. There was some opposition and indications are that a separate hearing may be ordered for the exclusive purpose of deciding this question.

The apparent stable demand for Texas crude indicated that purchasers do not anticipate any substantial contraction of requirements as a result of nation-wide rationing.

Alleged inequities in certain fields, particularly those producing crudes with no special qualities for war materials, were aired before the commission. The entire question centers around "selective proration." Operators in some fields where pipe-line affiliates of refineries producing war materials have reduced runs expressed a preference for complete shutdowns rather than continue the unequal drainage conditions now prevalent.

A proposal was made that the East Texas salt-water "remuneration" order be amended to permit transfer of oil allowables to other leases instead of restricting this relief to other wells on the same lease. Difficulty has been encountered, it was said, because there are usually no wells on leases making excessive volumes of water from which the transferred oil allowables could be withdrawn.

Conversion of the Texas proration system from a per-well to a lease basis is one of the most complex problems recently placed before the Railroad Commission. Olin Culberson, commissioner, does not favor the change, asserting that it would contribute to unequal drainage and other possible inequities.

The conversion is favored by a majority because of the current difficulty in obtaining field equipment. Fields developed on close-spacing patterns and which may now be depleted to the pumping stage are practically prohibited from obtaining lifting equipment unless an exception is obtained to M-68. The same inherent advantages of the lease-allowable system exists for other fields developed on wider drilling patterns in that operators would be released from the necessity of taking allowables from each well. It is conceivable, under the suggested program, that a 40-acre lease with three pumping wells and one flowing well could produce the entire allowable for the four wells through the one natural producer.

The fear of drainage inequities, operators who favor the program pointed out, could be averted by close control over assignment of lease allowables and by specifying the wells through which the oil could be withdrawn. Recent reports from Washington that the Office of Petroleum Coordinator is working on a program of "selective abandonment" in order to free the steel and other materials in unnecessary wells appears to tie into the picture of lease allowables. If operators in densely drilled fields were authorized to take allowables from only a portion of the completed wells, it is obvious that equipment from those retired from active production could be used more profitably as supplies for development of additional reserves.

The general outlook is for a redistribution of available oil-field equipment. Transfer of allowables from unnecessary wells to others on the same lease or on consolidated acreage would permit pulling the retired producers and utilization of the salvaged equipment in other fields now being developed under the wider spacing restrictions of M-68.

## OKLAHOMA

PRODUCERS AND PURCHASERS in Oklahoma have been invited to present testimony on field conditions and crude-oil demand particularly in October and more generally for the next 6 months at a Corporation Commission hearing in Oklahoma City, Okla., September 29.

"Please be prepared," J. J. O'Loughlin, conservation officer, wrote in hearing notices, "to put on testimony as to your market requirements on a ratable taking basis for the 6-month period. Also, be in a position to give the commission the benefit of your views as to the manner and method of establishing potentials best suited for the area in question."

## ARKANSAS

TESTIMONY CONCERNING producing conditions in prorated fields was entered in records of the Oil and Gas Commission September 23 at Texarkana where this month's hearing was held.

The commission heard testimony on the optimum equitable daily rate of production from the state's flush fields and again considered the question of whether or not the Dorcheat, Macedonia, McKamie and Texarkana condensate fields should be closed in until such time as the natural gas can be processed and utilized.

Application of G. H. Vaughn, an operator in the Stephens field, Columbia and Ouachita counties, was considered requesting that 20-acre spacing be established for continued development. The original order of the commission, Reference 30-41, issued September 26, 1941, set up 10-acre drilling units. With the issuance of M-68 the spacing rule was changed by federal authority to one well to each 40 acres.

Establishment of field rules for the Texarkana gas condensate pool of Miller County was another matter considered by the commission.

## CALIFORNIA

THE DEMAND for California petroleum products which has been rising for the past several months indicates that the state's crude-oil allotment during the remainder of the year will continue about unchanged unless gasoline rationing is made more severe than generally anticipated.

There have been no developments to indicate a decline in fuel-oil demand and for this reason it would not be surprising if the October crude allotment for California remained at its present level.

Fuel-oil demand can be expected to continue to increase as all western railroads are working to the limit and are asking for additional locomotives.

## INDIANA

A REQUEST that Indiana operators who have old producing wells now idle because of noncommercial yields advise the Department of Conservation of their locations and physical condition was issued last week from the office of Hugh A. Barnhart, director. In a memorandum to all operators, Mr. Barnhart wrote that the Office of Petroleum Coordinator was interested in devising a plan whereby pipe and other equipment may be salvaged from inactive oil or gas wells.

"I am anxious," Mr. Barnhart wrote, "for the state to take an active part in the utilization of all available used steel which can be reclaimed and suggest that all operators or persons having or knowing of producing wells that have been inactive for a long period of time, from which pipe or other equipment could be salvaged, furnish us with a list of the number of such wells and their location."

Operators were asked to respond to the Department of Conservation, Division of Geology, Room 415 State Library Building, Indianapolis.

## WYOMING

THE STATE last week joined in the effort to have the crude-price ceilings adjusted upward for Wyoming black oil to conform to Mid-Continent quotations. The brief was filed with the Office of Price Administration by Ewing T. Kerr, attorney general. His chief contention is that during the inactive period in black-oil production prices did not keep pace with other grades and that under existing conditions it can be produced at ceiling prices only at a loss. Since October 1, 1941, competitive conditions have arisen which makes Wyoming black oil essential to the war effort and only by putting prices on a competitive basis can the demand be supplied, Mr. Kerr contends.

The OIL AND GAS JOURNAL

PRODUCING REFINING NATURAL GASOLINE PIPE LINE

Published weekly by The Petroleum Publishing Company at Tulsa, Oklahoma

# More Pipe Lines Needed

This Annual Pipe Line Number marks another year of outstanding achievement for those who operate 300,000 miles of crude-oil and natural-gas arteries and those who have had the responsibility of laying hundreds of miles of new lines.

The war struck immediately and directly at petroleum's transportation removing from domestic use most of the tanker fleet which normally moved more than one-third of all the oil consumed within our boundaries. Water shipments of the United Nations outside this country were quickly disrupted.

The industry generally knows what its transportation division has done in the solution of these problems that were created overnight. Capacities have been stepped up, flows reversed, product lines converted to crude-oil service and vice versa, tank-car and truck shipments increased many times and inland waterway movements greatly expanded. Many of the things that have been done belong to the war's "impossible" activities.

Now the pipe-line companies are engaged in several construction projects designed to aid in relieving the petroleum shortage in the eastern part of the United States. One of the projects is a single line with sufficient ultimate capacity to supply all the oil consumed in pre-war Germany and Japan.

Great as these accomplishments of the industry's pipe liners are, it is folly to assume that petroleum's transportation war job has been completed. More remains to be done than has been done so far.

New tanker capacity is coming off the ways at a record rate with further increases assured for next year. But these units will be needed to serve the widely scattered war fronts and there is no assurance that additional tankers will be available for coastwise service.

Full credit goes to the tank-car owners and to the railroads for closing a large part of the transportation gap with shipments which have taken the place of more than 175 Gulf Coast-Atlantic seaboard tankers. But recent rail movements cannot be maintained indefinitely due to the wear and tear on equipment and the necessity of taking care of other war transportation requirements. Furthermore, large-scale rail shipments add materially to the war costs.

So far as the rearrangement and extension of pipe lines are concerned the present program is largely patch work. The 24-in. line to Illinois should be extended to the Atlantic Coast refineries as originally planned.

The other projects will facilitate the rail movement of oil to the East by shortening hauls. But they are essentially makeshifts applied to a situation where something had to be done quickly with a minimum of materials.

If a tanker shortage of a million or more barrels daily is to continue for the duration then there will have to be substantial additions to the industry's interstate pipe-line system. The fact that lines of large capacity operate at a cost comparable with that of water movements and that they are desirable in a permanent defense program, adds to their attractiveness.

The needed new lines will have to connect directly to areas where new supplies are already available or where substantial reserves have been established. This transportation expansion so that producers and refiners can keep pace with demands is not a stopgap but one which is industrially sound and one that would have been necessary had there been no war.

There is every reason to believe that failure to act promptly will mean shortages later which will cripple the war plans and give more encouragement and aid to the enemy than the transportation crisis of the past few months. The longer the war continues the greater the need for a sound transportation program in this country, based on adequate pipe-line facilities.

# Pooling of Products Coming Davies Tells N.P.A. Audience

By J. P. O'DONNELL

PITTSBURGH, Pa.—The National Petroleum Association, oldest of the oil-trade organizations, observed its fortieth anniversary at its annual meeting in Pittsburgh September 17-18 during which government and industry speakers appraised the present position of the industry and its prospects. This appraisal was summarized by Deputy Petroleum Coordinator Davies, who said, "Unpleasant and even tragic as today may appear . . . the destructive dislocations of war have in fact barely begun to be felt."

Harry A. Logan, vice president and treasurer of the United Refining Co., Warren, Pa., and president of the Elk Refining Co., Charleston, W. Va., was elected president of the association. Other new officers are Walter R. Reitz, secretary and treasurer of Quaker State Oil Refining Corp., Oil City, Pa., who was elected executive vice president; J. B. Fisher, executive vice president, Kendall Refining Co., Bradford, Pa., first vice president, and W. S. Zehrung, president, Pennzoil Co., Oil City, second vice president. Other officers were reelected.

Mr. Davies' discussion of things to come was the highlight of the 2-day meeting attended by more than 400 oil men.

### Unit Operations Necessary

"One prospect I see clearly ahead," Mr. Davies said, "is the need for greater unitization of industry operations. By this I mean the joining together of normally separate entities to accomplish a sharing or joint use of facilities and resources. As shortages of materials and later of manpower force a greater economy in the immediate physical operation, the oil industry must come more and more to operate as a unit. The identity of the individual operation must at many points be submerged to attain the greater return from a lesser expediture. . . .

"I am myself the more enthusiastic today over the prospects of success in our cooperative activity with industry by reason of meetings which in the past 2 days have been held with executives of all East Coast oil companies. The problem under consideration is the need for separate companies banding together to meet the needs of the present as an industry and foregoing individual identity to the extent necessary for the time being. Joint use of terminals, stock pooling and sharing, combination arrangements designed to eliminate lost motion and waste—all were the subject of discussion. The response from this group has left nothing to be desired. They have shown a complete readiness to do all that we find it necessary to ask. This spirit augurs well for the future, not only of the war program but of the oil industry itself because the future of oil is being determined by just such intelligent and unselfish disposition to serve the nation today.

"The impact of the war on the petroleum economy," Mr. Davies continued, "cannot but result in certain casualties in the petroleum ranks. The most that can be done is to hold this casualty list to a minimum consistent with the controlling necessities of the war program and to see that principle and fair play are observed so far as lies within the influence of the directing government agency. No one should be required to suffer loss to the profit of another. We shall look to the industry to devise profit and loss sharing within its own membership and compensatory arrangements of one kind or another to do justice.

"If plants and storage are to be shared, it follows inevitably that products must to an extent be standardized so as to admit of common use. Various qualities of any given product can scarcely be continued if we are to obtain the benefit that should come from joint use of facilities. This is an inevitable part of any plan for the joint use of plant. Frankly, I can see no escape from the suspension of certain brand distinctions during the war period."

### Unified Direction Advocated

N. H. Weber, retiring president of the association and vice president of the Pure Oil Co., Chicago, Ill., called for unified control of the industry. Mr. Weber pointed out how different government agencies are issuing directives to the oil industry with respect to price ceilings, rationing, its part in the synthetic-rubber program, etc., and how all these agencies ask for reports which frequently duplicate one another and all of which are proving a tremendous burden to the industry's already overworked and depleted manpower. "One department should have the entire handling of the oil industry," Mr. Weber declared, and he cited the record of the industry's cooperation with the Government to date as evidence of its readiness to comply.

Bruce K. Brown, assistant deputy coordinator, reviewed the position of petroleum refining in wartime and made the significant statement that "it has become quite evident that the needs of the United Nations for 100-octane gasoline will eventually exceed the productive ability of all aviation-gasoline plants now built, building or authorized."

He briefed the refiners' job with the slogan: "Doing more with less." He said that "we must have more fuel oil, aviation lubes, aviation gasoline, toluene and, in some places, more coke. We must do with less maintenance and repair material and we must operate without replacing existing units with new units. We must make and sell a lesser proportion of motor gasoline. We must operate on proportionately less crude. We must operate with less skilled personnel. There must be more care used in forcing inspection for safety's sake. More ingenuity must be used in converting spare equipment to new and unplanned uses. Management and supervision, at least, must work longer hours."

The process of converting existing refining equipment "idle or possible of being shut down without impairment of the basic petroleum economy, simply must go," he said. There is an urgent need for 6,000 bbl. of isobutylene for aviation gasoline which can be obtained from refinery gases by the installation of simple equipment made of used or spare parts, Mr. Brown said, adding that additional quantities will be needed for synthetic rubber. Alkylate, benzene which

### MEETING HIGHLIGHTS

**Election of Harry A. Logan president. His biography and picture appear on Page 248.**

**Pooling of products, abolition of brands, common use of distribution facilities and other cooperative operating practices will probably be made compulsory.**

**Refiners urged to find new markets for motor gasoline to survive the receding demand for light products on the one hand and increased requirements for fuel oil on the other.**

**The oil industry makes a poor economic showing in comparison with other manufacturing operations, failing by 14 cents per barrel to equal the increment of over-all income per unit.**

**United Nations' requirements of 100-octane gasoline will eventually exceed the capacity of all plants now built, building or authorized. (See Page 220.)**

*Ralph K. Davies, deputy petroleum coordinator, disclosed progress of negotiations for pooling certain products on the East Coast and for common use of distribution facilities*

will be needed in large quantities in a few months and butadiene are also capable of being manufactured by processes employing used or second-hand equipment, he said.

The marketing problem "which presses for solution right now—and above all others—is the problem of fuel oil," Robert T. Collier, director of the OPC Marketing Division, declared. With respect to the steps they should take, he advised oil men: "First—frankness with your customers. The marketer who foolishly minimizes the fuel-oil crisis will assuredly regret his failure to be frank and foresighted. Next, and equally fundamental, look now to the consolidation of terminals, bulk plants and trucking facilities. Certain items which you have already considered essential to the preservation of your business identity may have to be cast aside for the duration. The decision may rest between identity and survival."

Earlier Mr. Collier said that adjustments to the new war situation are creating—and will continue to create—the bases for gasoline surpluses. Gasoline is necessarily manufactured as other essential petroleum products are made in advancing quantity. "And thus," he continued, "for a variety of insurmountable reasons, we are faced with a developing surplus of gasoline supplies. It must go somehow, some way into new channels of consumption or into old ones revived. Some may redevelop markets lost to tractor fuel. In some areas gasoline may be used to enrich water gas such as in the East where a market for 13,000,000 bbl. exists. The challenge of developing new markets is no new one for the oil industry and I have no doubt of your willingness or ability to meet this one."

### Appearances May Be Deceptive

John D. Gill, Atlantic Refining Co. director and chairman of the Petroleum Industry War Council committee studying impacts of the war on oil, discussed some of the economic effects.

"The apparently improved over-all status of the industry seems to bespeak the benefits of a planned economy," Mr. Gill said, "but a hasty conclusion to that effect may result in grave error. First, the changes are possible only because of the exigencies of war. Second, favorable factors are offset by the loss to the public of service of great but undetermined value. Third, there is only one crop of improvements possible by the procedure of concentration and cooperation. Thereafter, any progress must be achieved through the exercise of initiative as in the free-enterprise system hich has brought us to our present high state of economic development."

In reviewing the financial effects, Mr. Gill showed that while most recently available figures indicate that the industry is better off than in the OPA base period, 1936-39, closer scrutiny reveals a different aspect. He compared the record of oil with that of all manufacturing to show that, using the OPA base period as 100, the index of production for oil in the second quarter has risen to 109 against an indicated 177 for 1942 for all manufacturing, the index for income produced had risen to 121 for oil against 217 for all manufacturing and the index for income per unit of production had risen to 111 for oil against 120 for all manufacturing. Had oil received as much per unit as all manufacturing, its over-all income would have been up 14 cents per barrel. "It is no mere coincidence," Mr. Gill states, "that this figure approximates the combined estimates of the thus far uncompensated costs of compliance with governmental directives."

Gen. W. B. Pyron, War Department liaison officer for petroleum, urged refiners not to let the soldiers down. "Give them the best fuels and lubricants you can produce and they will do the job for you on all the fig ting fronts," he said.

The industry's task of supplying products to meet the specifications is not an easy one, he continued. More air-cooled engines are being used by the Army whereas the peacetime job of the industry was to fuel and lubricate liquid-cooled engines almost exclusively. In addition these engines must operate at temperatures ranging from 20° to 40° below zero to 120° above and under a vast variety of terrain conditions. One of the most difficult jobs of the Army, one that has entailed a vast testing program and required the accumulation of data from all combat areas, has been the preparation of specifications that will enable it to obtain fuels and lubricants which will meet all these conditions and yet be held at a numerical minimum to expedite handling and reduce transportation difficulties. Other United Nations have been asked to adopt the same specifications so that petroleum products may be exchanged anywhere.

Possibly the toughest job, General Pyron said, has been writing heavy-duty lube and grease specifications. Additives have been found essential but since they cannot be used with certain base stocks they thereby reduce the supply. He discouraged those who would have gasoline specifications changed with respect to sulfur content or vapor pressure. He declared that vapor pressures would not be allowed to exceed 8 lb., and reminded those who urged higher vapor-pressure specifications to regard the disastrous possibilities of vapor-lock developing on the field of battle.

Hallett Abend, for 15 years the New York Times chief far eastern correspondent, discussed the war in the Pacific. He deplored the fatal lack of preparedness and the completely unfounded overconfidence of the British and Americans, recalling General MacArthur's prediction on October 3, 1941, that, given 2 months, he did not care what would happen and that a Japanese invasion of the Philippines would cost them 1,000,000 casualties and 5,000,000,000 yen. He praised the Dutch destruction of oil properties, saying that all pipe lines were dynamited every 1,500 ft. He did not regard a separate Russo-German peace as outside the realm of possibility and viewed such an action as our greatest possible danger at the moment.

Lt. Comdr. W. C. Latrobe, U. S. Navy, and Maj. John L. King, U. S. Army, spoke on lubricants at a closed meeting of the Department of Manufacture.

•

# Impact of War Keeps Profit Trend of Industry Downward

By JOHN D. GILL
Atlantic Refining Company

**The paper, of which this is an extended digest, was presented at the annual meeting of the National Petroleum Association in Pittsburgh, Pa., last week under the title: "Wartime Changes in the Petroleum Economy." The author is a director of Atlantic Refining Co. and is chairman of the Petroleum Industry War Council committee on impact of the war on the petroleum industry. Mr. Gill's committee made a preliminary report on its findings at the September meeting of PIWC and will submit a more complete survey at the next council assembly.**

THE impacts of the war are bearing down heavily upon the operating, administrative and investing personnel of the industry. The first half-year profit rate, 5.9 per cent on net worth, for a substantial sample of the industry was 15 per cent below the 7 per cent for the 1936-39 base period arbitrarily adopted by the OPA. Moreover, due to the impacts of the war, the indications are that during the current year the profit trend has been downward. In the first quarter of the year, the profit rate approximated 6.6 per cent, even then below the arbitrary standard set up by OPA. The rate declined to only 5.4 per cent in the second quarter, almost as low as in the acknowledged depression year of 1938. There is no fat represented by these figures to feed the industry while it overexerts its financial resources in carrying out costly governmental directives.

These few figures tell a story full of significance. But there is another broader way, requiring more figures in more involved relationships, to tell the same story—a way that should persuade the sharpest critic of our efforts to obtain equitable treatment at the hands of governmental agencies.

### Price Rise Distorts Picture

In the 1936-39 arbitrary base period, all elements of the oil industry, collectively, received on the average annually a total income from industry operations of $1,794,000,000, or 2.64 per cent of the national income. In the second quarter of 1942, these elements received a dollar income at the annual rate of $2,172,000,000 or 21.2 per cent greater than during the base period. The service rendered by the industry as measured by the barrels of crude oil run to stills, totaled 1,164,000,000 while, in the second quarter of 1942, the barrels processed were at the annual rate of 1,269,000,000 or 9 per cent greater. Putting these two sets of figures together, there is derived the fact that, in the base period, $1.54 per barrel of over-all income was received by all elements whereas, in the second quarter of this year, $1.71 was received, or 17 cents more. Superficially, it would seem that we were better off in the more recent period. The apparent improvement, however, is attributable directly to an increase in the general level of prices exceeding that of our industry's apparent advantage.

But we must not stop our examination of the

*(Continued on Page 221)*

# Military Drain on Manpower May Handicap Oil Industry

By H. STANLEY NORMAN

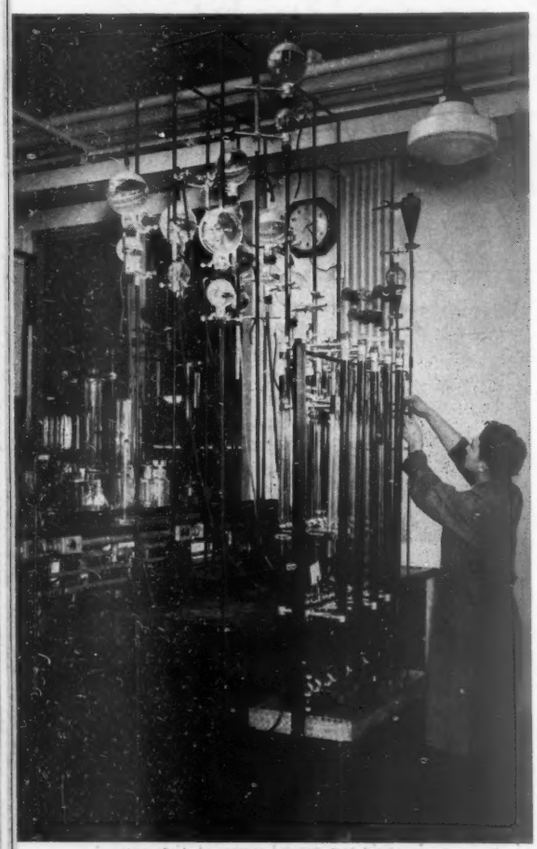
**Inordinate drains on the petroleum industry's skilled and technical personnel by the Selective Service System and other war industries will impede progress and impair productivity. The industry has been advised to inventory its manpower and make ample provision to maintain its effectiveness at a level dictated by war.**

**Failure to apply for deferment for key men will be construed, Maj. Gen. Lewis B. Hershey has declared, as "negligent" omission on the part of war-industry management.**

**This review touches on some of the companies' policies and relates their experiences in obtaining deferment for key men essential to efficient operations during the emergency.**

THE drain of manpower from key positions in the petroleum industry by the Selective Service System, voluntary enlistments and attractions of other war enterprises has reached a stage where new obligations are imposed on management. Virility of the industry must be maintained. Responsibility for preserving the industry's skilled and technical personnel to whatever level necessary to insure war requirements of quantity and quality is essentially assigned to management.

In some instances, the whole concept of patriotism must be revised and reconsidered from the standpoint that the oil industry has one of the most vital obligations in the entire war program. Faulty appraisal of the industry's manpower requirements in fulfilling the main obligation of maintaining adequate petroleum supplies for military forces of the United Nations could be the difference between defeat and victory.



*Complex research and development in the oil industry, symbolized by this testing operation in Shell Development Co.'s laboratory, requires trained personnel*

There is a growing appreciation for the necessity of maintaining key personnel at maximum efficiency. Inclusion of petroleum in the list of essential industries by the Selective Service System implies in itself an obligation on managements of oil companies to maintain their staffs at a level of high productivity.

Operations of a few companies already have been degraded by the migration of skilled workers or technicians into military service and other war industries. Other companies report their relinquishments of manpower are just about in balance with reduced requirements at the present level of operations. Still other companies indicate that additional sacrifices of skilled and technical men would not materially impair their efficiency, partially because training programs have been intensified in anticipation of such eventualities.

Most of the larger companies have followed instructions from Maj. Gen. Lewis B. Hershey, director of the Selective Service System, in seeking deferments for men indispensable to the effective fulfillment of their organization's functions in the war program.

### Real Pinch Still Ahead

Drains on the technical personnel have been most acute in the divisions of research, manufacturing and construction although company executives concede that the real pinch in manpower lies ahead. This implies that the necessity of projecting minimum requirements for duration of the war is just now reaching a critical stage.

So far as skilled and technically trained men are concerned, the Selective Service System has pulled hardest on what might be considered the secondary layer of oil-industry personnel. However, the tardy elevation of the petroleum industry to a classification of "essential to the support of the war" contributed to a rather extensive migration of the group between 20 and 35 who, in many instances, had 10 to 15 years' experience in their oil-company jobs. Men who registered in the first draft, uncertain for the first several months of the war concerning the essential status of the petroleum industry, accepted employment in war plants or volunteered for military service. Some migrated because of monetary attractions, others transferred feeling their chances for deferment from military service would be enhanced and still others changed jobs convinced that they could thereby make a more direct contribution to the war. Most of the considerations were purely personal matters and, until Bulletin 15 was issued by the Selective Service System definitely establishing petroleum as an essential industry, oil-company managements were morally limited in the degree of suasion they could use in discouraging migration.

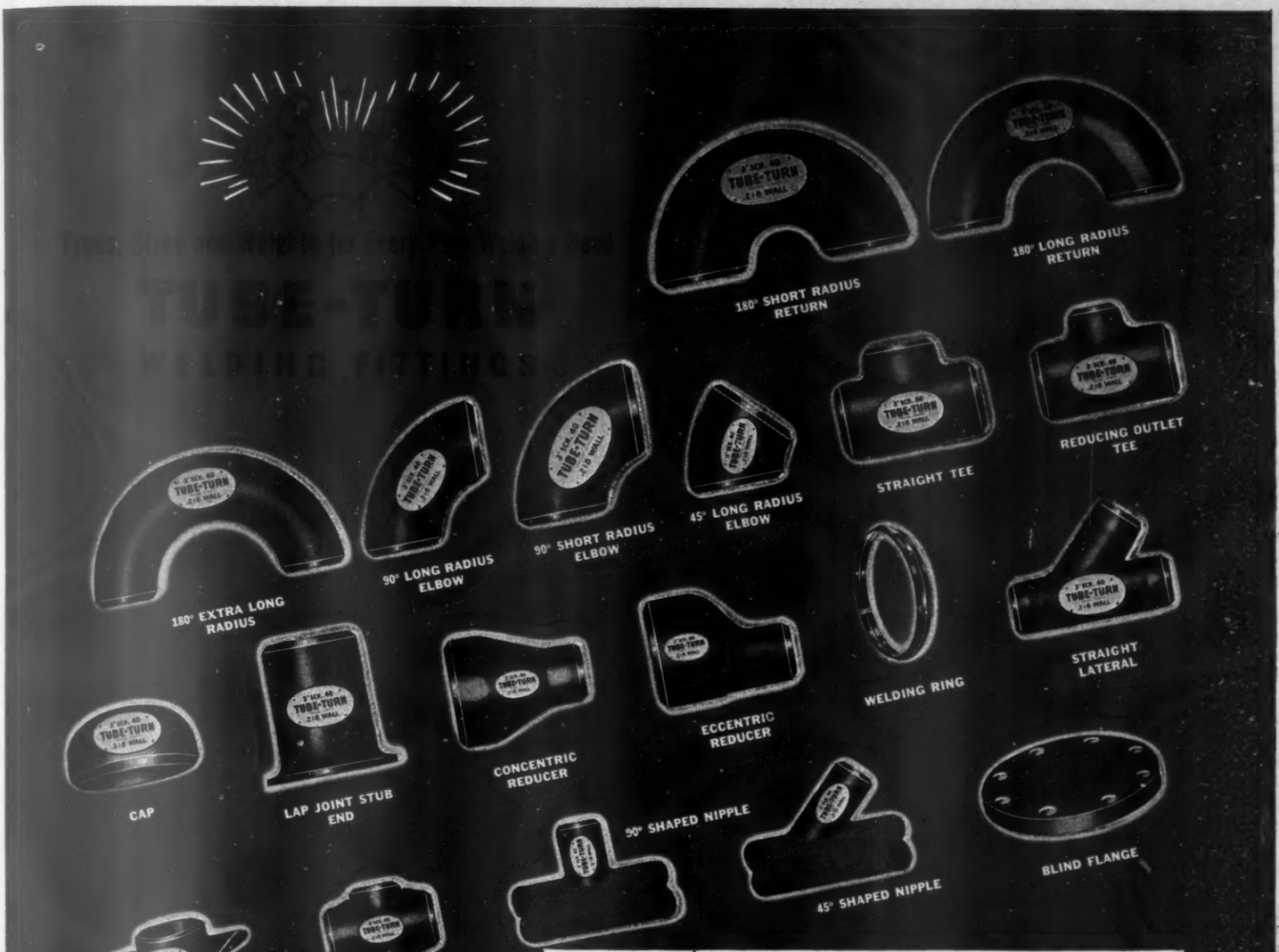
Bulletin 15 has changed the official status of the petroleum industry. Company executives are no longer reticent about full use of suasion on essential employes who may be considering voluntary military service or employment in the munition industries. In fact, most companies are now using essential classification of occupations in the petroleum industry and other inducements to hold their personnel intact. Managements are pointing out that men returning from military service will be given first consideration in reshapement of organizations for peacetime expansion and that the employe who transfers to another war industry on his own volition is permanently severing his company relation.

### Draft Boards Reasonable

A large majority of the deferments requested by oil companies are being granted by local draft boards. One reason for absence of general complaint is that the petroleum industry as a whole has virtually "leaned over backward" in limiting deferment applications to the most essential men. Lack of specific knowledge by local draft boards on the essential character of occupational classifications in the petroleum industry has been the cause of most criticism by oil companies on mechanical operation of the Selective Service System. Most companies, on reflection, are inclined to blame themselves for the loss of any one or several essential men. Experience has convinced most of the companies that local boards, even those outside the oil country which could not be expected to understand the petroleum industry classifications, will give sympathetic consideration to deferment applications when fully advised of the facts. There are exceptions, of course. In one or two instances, draft boards have been accused of drawing majorities of their quotas from oil-field workers who at the time of registration were temporary residents of small communities.

A growing degree of coordination between the various federal agencies exercising jurisdiction over manpower is indicated in recent official actions although lack of a completely unified program continues to draw criticism from oil men and other industrialists. Last week, however, the War Department announced a joint Army-Navy policy regulating the enlisting or commissioning of civilians employed in specific war industries, including the oil business.

Civilians occupying key positions in federal agencies and in a list of other occupations in war industry, including petroleum operations, will not be accepted for commission or enlistment with-




**TUBE-TURN WELDING FITTINGS—RANGE OF SIZES**

| TYPE OF FITTING | DESCRIPTION | STANDARD WEIGHT | EXTRA STRONG | SCHEDULE 160 | DOUBLE EXTRA STRONG |
|---|---|---|---|---|---|
| ELBOWS | 90° LONG RADIUS | ½"-24" | ¾"-24" | 1"-12" | 1"-8" |
| ELBOWS | 90° SHORT RADIUS | 1"-24" | 1½"-24" | | |
| ELBOWS | 45° LONG RADIUS | ½"-24" | ¾"-24" | 1"-12" | 1"-8" |
| RETURNS | 180° LONG RADIUS | ½"-24" | 1"-24" | 1"-12" | 3"-8" |
| RETURNS | 180° SHORT RADIUS | 1"-24" | 1½"-24" | | |
| RETURNS | 180° EXTRA LONG RADIUS | 1"-2½" | 1"-2½" | | |
| TEES | STRAIGHT | ¾"-24" | ¾"-24" | 1"-12" | 1"-8" |
| TEES | REDUCING OUTLET | ¾"-24" | ¾"-24" | 1"-12" | 1"-8" |
| REDUCERS | Concentric and Eccentric | 1x¾"-24x20" | 1x¾"-24x20" | | 1x¾"-12x10" |
| CAPS | | 1"-24" | 1"-24" | | 1"-24" |
| STUB ENDS | LAP JOINT | 1"-24" | 1"-24" | | |
| NIPPLES | Shaped, 90° or 45° to Header | 1¼"-12" | 1¼"-12" | | |
| SADDLES | | 2"-24" | | | |
| LATERALS | | 1¼"-24" | 1¼"-24" | | |
| CROSSES | | 1¼"-24" | 1¼"-24" | | |
| RINGS | | ¾"-12" | 1¼"-12" | | |
| | | 150, 300, 400†, 600 and 900† Lb. | | 1500 Lb. | 2500 Lb. |
| FLANGES | WELDING NECK | ½"-24" | | ½"-24" | ½"-12" |
| FLANGES | SLIP-ON | ½"-24" | | ½"-12" | ½"-12" |
| FLANGES | LAP JOINT | ½"-24" | | ½"-24" | ½"-12" |
| FLANGES | THREADED | ½"-24" | | ½"-12" | ½"-12" |
| FLANGES | BLIND | ½"-24" | | ½"-24" | ½"-12" |

† Dimensions on sizes thru 3½" same as for 600 lb. flanges.

* Dimension on sizes thru 2½" same as for 1500 lb. flanges.

For sizes of light gauge and super-weight fittings, forged steel flanges, and for complete specifications on all Tube-Turn fittings, refer to Tube-Turn Catalog.

# TUBE-TURN *Welding Fittings*

TRADE MARK

The FIRST WELDING FITTINGS 1ST AND STILL THE BEST

TUBE TURNS, INC., LOUISVILLE, KY. *Branch offices:* New York, Chicago, Philadelphia, Pittsburgh, Cleveland, Tulsa, Houston, Los Angeles, Washington, D. C. *Distributors in all principal cities.*

out first obtaining a written release from the head of the agency or the war industry concerned. These key civilians include executives, heads of major divisions or departments and principal subdivisions and technical experts whose principal duties involve design, planning or research.

This new policy may halt some of the voluntary migration of service-age technicians and junior executives from the oil companies but it does not necessarily alter the industry's relationship with the Selective Service System. The necessity for filing exemption applications on key men subject to induction by the draft remains the same. But there will be a tendency to stabilize the voluntary drift of men essential to industry into military service.

In some instances in which oil companies' applications for deferment have been rejected by local Selective Service boards, relief has been obtained by appeal to the state classification counselors. Appeals are occasionally taken over the head of the local draft board because of obstinance in considering merits of the deferment application. Companies have been guided entirely since the early part of August by the list of essential occupations in the oil industry issued by General Hershey. Washington headquarters of the Selective Service System, however, admits that the general policy enunciated in Bulletin 15 is not binding on local draft boards and that the essential oil-industry occupations listed therein are entirely for guidance and are in no way binding.

### Transfers Resented

A few local draft boards retaining service jurisdiction over men who have been transferred to other oil operating centers since registration appear to resent such shifts which are entirely normal in industry practice. A few cases have been reported under these circumstances in which applications for deferment have been summarily rejected by local boards. Experience of companies in such cases has indicated that, assuming the deferment application is legitimate and filed in behalf of a key man whose importance in the production of war materials can be substantiated, the state classification counselor usually can obtain relief.

The most imminent shortage of manpower in the petroleum industry is in development personnel. One of the large Mid-Continent drilling contracting firms has lost 90 per cent of its engineers which, in this particular case, included college graduates assigned to crews as motormen. Other contractors with similar employment policies report comparable losses. However, at least 50 per cent of the young engineers drawn from contractors' pay rolls into military service were reserve officers and esponged from the potential oil-field manpower with the declaration of war. The other 40 per cent of young engineers previously working as members of drilling crews either have volunteered for military service, have been inducted by the Selective Service System or have migrated to other defense industries.

Any possible stigma previously attached to applications for deferment has been completely removed by instructions from General Hershey, who said in a recent enunciation of policy: "The employer engaged in essential war production who has been required to greatly expand his plant and who then fails to request deferment for his key men is negligent."

Some oil companies, particularly producing companies, have indicated that their operations can be continued unimpaired if they are permitted to retain 5 to 10 per cent of their key personnel. This assumes, of course, that production requirements remain substantially unchanged.

# Oil Regulators Aid Scrap Drive

STATE petroleum regulatory commissions are cooperating unstintingly with salvage committees in various parts of the country in an effort to make the maximum tonnage of unused steel and other materials available to the nation's mills.

Michigan and Indiana commissions this week joined other oil states in tangible action to collect all available scrap metal from inactive wells and other petroleum operations. Regulatory commissions of both states are compiling lists of abandoned and inactive wells which are available to salvage contractors, well pullers, junk dealers, and others in position to recover casing. Similar records, although not in exactly the same form, are available in Texas, Oklahoma, Kansas, Illinois, Arkansas, Louisiana, the Rocky Mountain states, and the Pacific Coast area.

Operators in all branches of the oil industry were urged this week to continue their combing of properties for scrap. Most oil companies report that their salvage work is now organized on a recurring basis and that they are making periodical checks to keep their yards and properties clear of all materials for which there is no apparent need. Some companies have established an arbitrary policy of scrapping all equipment which has been retired from service for 3 months and for which there is no obvious need for a similar future period.

## CRITICAL OCCUPATIONS: PETROLEUM, NATURAL-GAS AND NATURAL-GASOLINE ACTIVITY

Accountant
Acid-recovery plant operator
Analyst, geophysical
Blacksmith
Boilermaker
Brickmason, refractory
Carbon-black plant operator
Carpenter
Cementing (well) operator
Chemist
Chief clerk
Claim adjuster
Coke burner
Coke-oven mason
Coke-oven repairman
Compounder
Computer, geophysical
Core-analysis operator
Dehydration-plant operator
Derrickman
Designer, equipment
Dispatcher
Draftsman
Driller
Electrical-logging operator
Electrician
Engineer, operating, chief station, boilerhouse
Engineer, operating, compressor
Engineer, operating, hoist
Engineer, operating, locomotive
Engineer, operating, natural gas
Engineer, operating, power
Engineer, operating, processing
Engineer, operating, supervising
Engineer, operator, processing
Engineer, professional, technical
Ethyl blender
Filter-house operator
Fishing-tool operator
Foreman, boilermaker
Foreman, carpenter
Foreman, coal washing
Foreman, coke products
Foreman, communications
Foreman, electrician
Foreman, filler and package
Foreman, fire crew
Foreman, coal products
Foreman, gas measurement
Foreman, heat treating
Foreman, insulator
Foreman, leads
Foreman, machine shop
Foreman, maintenance and repair
Foreman, petroleum refining
Foreman, pipe shop
Foreman, production
Foreman, rigbuilding
Foreman, shipping
Gas-lift plant operator
Gasoline-plan operator
Generator operator
Geologist
Geophysicist
Glass blower (instrument)
Grease maker
Gun-perforating operator
Houseman
Inspector, mechanical
Instrument repairman
Insulator, boiler, steam.
Interpreter, geophysical
Laboratory technician
Landman, chief or division
Lead burner
Machinist
Maintenance mechanic
Manager, employment
Manager, office
Manager, operations
Manager, personnel
Manager, traffic
Material and warehouse inspector
Material inspector
Metal and equipment inspector
Metallurgist
Oil blender
Oil pumper, refinery
Party chief, geophysical
Physicist
Pipe fitter
Powerhouse switchboard controller
Purchasing agent
Rigger
Seismologist
Sheet-metal worker
Shooter, oil well
Stillman
Tank builder
Test-engine operator
Tool dresser
Tool pusher
Topman
Treater, oil-well acidizing
Treating-plant operator
Washerman
Wax-plant operator
Welder, combination
Welder, high pressure
Yardmaster

# Rationing of Fuel Oil May Be Indicative of Acute Shortage

WASHINGTON, D. C.—A nation-wide shortage of fuel oil in 1943 which may last for several years or perhaps indefinitely is foreseen by officials of the Office of Petroleum Coordinator.

Coupon rationing of fuel oil in 30 eastern and midwestern states scheduled to go into effect October 15 may be extended to the entire country next fall and even more drastic restrictions may be necessary. The demand for 100,000,000 bbl. of fuel oil annually must be eliminated during the next 12 months some officials estimate, even if compulsory conversion to other fuel is required to achieve this curtailment.

Shortage of transportation is the primary reason for fuel-oil rationing this fall. But an actual shortage of fuel oil is foreseen in the not distant future. These calculations are based on a long war and the drain on this country's crude-oil reserves in supplying almost the entire non-Axis world for 3 or 4 years. If exports of oil to the Allies and to United States fighting forces abroad have to be increased much more it will be necessary either to find more oil reserves or to curtail domestic consumption even more drastically.

For this reason the OPC is planning a nation-wide campaign for conversion from fuel oil to coal or some other fuel, directed particularly, for the present, at industrial users. The campaign which has been going on in District 1 for some months has now been extended to District 2, and within the next 30 days to 6 months engineers representing OPC are planning to call on every industrial user of fuel oil in the United States to urge conversion where possible and to advise on the best ways of doing so.

### Drastic Refinery Changes Likely

The fuel-oil situation was already serious in the East and North Central regions before the Baruch report recommended nation-wide gasoline rationing. This will mean a more drastic readjustment in refinery operations and, possibly, a sympathetic smaller production both of distillate and residual fuel oil. By next year, however, it may be necessary to make war products such as butadiene and components of aviation gasoline by cracking a larger portion of distillate fuel oil. If both military exports and conversion of distillate to war products increase, the shortage of fuel oil may be extremely acute.

The amount of oil to be allowed each heating unit starting next month under the rationing plan, which is gaged to cut consumption 25 per cent in the affected area, will be based on several factors, chief among them being floor space in the house and the amount of fuel used last year.

Employing a formula worked out by the Office of Price Administration in consultation with the heating industry, local rationing boards will determine the number of gallons of fuel oil to maintain daytime temperature of 65° under average weather conditions. Adjustments then will be made on the basis of past consumption.

The coupon rationing plan will operate on the "flow back" system, with the consumer's coupons being used at every step by suppliers to replenish stocks. The rationing control will cover all distillate and residual-fuel oils, including kerosene and diesel oils, regardless of the use to which they are put.

The rationed area, which contains the homes of some 97 million people, comprises the states of Minnesota, North Dakota, South Dakota, Nebraska, Kansas, Iowa, Missouri, Michigan, Illinois, Wisconsin, Ohio, Indiana, Maine, New Hampshire, Vermont, Rhode Island, Connecticut, Delaware, New York, New Jersey, Maryland, Pennsylvania, North Carolina, Virginia, South Carolina, West Virginia, Kentucky, Georgia, Florida, Massachusetts and the District of Columbia.

Several midwestern states were included because of shortages within their boundaries brought about by diversion of tank cars, normally used to supply their own needs, to help alleviate the shortage in the East. Rationing was ordered by the War Production Board to insure a fair distribution of available fuel.

Wide disparities in climate throughout the 30 states will be considered in determining the rations householders will receive.

The rationed area has been divided for this purpose into four thermal, or heat, zones. In addition numerous subzones are being established to provide for ration adjustments in localities where the climate has been found to be unusual.

"The critical nature of the fuel-oil shortage has caused us to design the rationing plan to stimulate conversion of oil burners to coal," Joel Dean, fuel rationing chief, said. "We also planned it to provide as nearly as possible, an equality of comfort among those who depend on oil for heat. This means that the oil-heated house in Florida where temperatures never go very low, won't get nearly as much fuel oil as the house in North Dakota where subzero weather is the rule during winter. None of them will get as much as usual."

Zone boundaries, Mr. Dean explained, were established after a careful study of U. S. Weather Bureau reports covering the last 43 years. From these reports OPA heating engineers found out the number of degree days that are normal for each region.

"Degree days" is a measurement of intensity and duration of the heating season. The degree figure for a locality is the average number of days in the heating season there multiplied by the number of degrees of heat required to raise the temperature of a house from the average outside temperature to the 65° level to be allowed under fuel-oil rationing.

Wherever possible state lines have been followed in setting up the thermal zones. However, because the climate varies extensively in certain states, the zone lines cut through some states and follow county lines.

OPA announced the four zones as follows:

Zone A—Maine, New Hampshire, Vermont, 15 counties in northern New York, Michigan, Wisconsin, Minnesota, North Dakota, South Dakota, and northern part of Iowa.

Zone B—Massachusetts, Rhode Island, Connecticut, New York (except upper 15 counties), Pennsylvania, New Jersey, Nebraska, and parts of Ohio, Indiana, Illinois, Iowa, Kansas and Missouri.

Zone C—Delaware, Maryland, Virginia, West Virginia, District of Columbia, Kentucky, lower parts of Ohio and Indiana, and Illinois, Missouri, and Kansas.

Zone D—North Carolina, South Carolina, Georgia, Florida east of the Appalachicola River.

*This degree-day map, showing the averages of records for 44 years, will be the basis for fuel-oil rationing. All the area east and north of the heavy white is to be rationed by coupon after October 15. A degree-day is a period of 1 day during which the temperature is 1° below 65. For example, if the average temperature for 1 day is 60° that constitutes 5 degree days*

# Cartelization of Eastern Industry Is in Prospect

By HENRY D. RALPH

WASHINGTON, D. C.—Virtual cartelization of the petroleum industry in the eastern part of the United States will be ordered by a directive to be issued by the Office of Petroleum Coordinator, probably within a week.

All companies marketing petroleum products in OPC District 1, the 17 Atlantic Coast states, will be required to pool their supplies and, to a certain extent, their distribution facilities. Oil will be dispatched from western loading centers in trainload lots direct to designated central unloading points from which all marketers will receive their supplies for local distribution.

The plan is expected to add around 75,000 bbl. per day to the East Coast deliveries, through increased efficiency of tank cars.

Coordinator Harold L. Ickes described the plan as requiring the oil companies to get into bed with each other. An oil man described it as making one big company out of the entire industry in the eastern area.

Variously referred to as the products-pool plan and the supply and transportation-allocation plan, the program was worked out jointly by industry committees and the OPC during the past several weeks. Its objective is to get greater use of trainload shipments of oil. Under present operating conditions only about 20 per cent of the rail movement of oil is in trainload lots all the way from origin to final destination, because after reaching the East small lots of tank cars are fanned out to various bulk plants. The intention is to move 100 per cent of the tank cars in trainload lots.

The presidents and policy-making officials of all large oil companies operating in District 1 met September 15 with Deputy Coordinator Ralph K. Davies to discuss the tentative plan worked out by the transportation and marketing experts. The plan was agreed to in principle, though there were some objections to certain of its details. A formal directive to put the plan into operation is now being drafted into legal language, and must be approved by the antitrust division of the Department of Justice. Its issuance is expected no later than the end of this week.

The pooling plan will apply to the four major products—gasoline, kerosene, distillate fuel oil, and residual fuel oil. Standard specifications for each product will be issued by OPC, and the stocks for all companies will be comingled in transit and terminal storage. For the present there will be three grades of motor gasoline, but their octane ratings may be considerably lower than prewar brands of major companies.

Whether this will result in the elimination of gasoline brand names is something which has not yet been decided. Apparently this question makes little difference to the operation of the plan. Some companies may prefer to keep their brand names on their pumps even though the purchasers know they are getting a government-standardized grade, while others may prefer to market under a "Victory Brand" or some such name.

All tank cars are to be loaded at designated western points, determined by the Petroleum Supply Division of OPC in accordance with availability of supplies. Industry committees on supply and distribution will select the unloading terminals for each trainload. District 1 will be subdivided into probably six zones for purposes of routing tank trains. No shipments may be made into a zone having refineries unless the manufacturing capacity is below the demand in that zone. This means that companies marketing in any area but having no local source of supply will have to buy or exchange gasoline with local refiners.

Primary suppliers, such as refiners and importers, will share receipts of oil in each zone on a formula based on the proportionate sales in that zone last year. Shippers apparently will have the choice of group buying or of individual company buying—at designated supply sources—with pooling of supplies after unloading.

Tank trains will go only to designated terminals capable of handling a trainload at a time. Normally, each terminal will have a regularly designated source of supply, though at times a train may be dispatched to a different terminal while en route. Some terminals may handle only one product, while others may handle all four.

After unloading, the oil will be stored in whatever tanks are available, regardless of company ownership. All suppliers will draw from these central terminals and will distribute by truck or barge, and, unless some exceptions are granted, no tank cars will be used for local distribution within District 1. Cross hauls and parallel routes must be eliminated in local distribution.

As presently drafted, the plan does not call for a sharing of local distribution and marketing facilities. However, it is quite possible that truck use regulations of the Office of Defense Transportation may require that filling stations and fuel-oil consumers be supplied from the nearest bulk storage plant regardless of company ownership. It is understood that there is nothing in the plan itself to require elimination of retail outlets, though a considerable reduction in the number of service stations can be expected as a result of standardization of gasoline grades, reduction of business due to rationing, loss of manpower to the armed forces and war industries, and other wartime conditions.

•

## Ickes to Address Annual Independent Association Banquet at Wichita, Kans.

Harold L. Ickes, secretary of the interior and petroleum coordinator for war, will address the Independent Petroleum Association of America at its thirteenth annual meeting. The meeting will be held in Wichita, Kans., October 19, 20 and 21, and the appearance of Secretary Ickes will be at the banquet the evening of October 21.

"The appearance of Mr. Ickes on this occasion is most timely," said Frank Buttram, I.P.A.A. president. "The independent producer today contends with many problems in his effort to be of maximum service in the war effort. Mr. Ickes, the head of the emergency organization created to coordinate the oil industry's activities, should be able to clarify our thinking to a considerable extent. There are numerous phases of our own activity on which we welcome his counsel.

"Mr. Ickes is known to be fond of getting first-hand facts and impressions. His visit to the oil country will afford him the opportunity to see a large number of the men who are looked to for a great part of the nation's supply of crude oil and who are counted on to find the greater part of the new reserves. We feel that his trip to the Mid-Continent oil country, the first in several years, will be of mutual interest and value."

•

# Carriers Seek Rate Increases On Crude, Fuel-Oil Shipments

WASHINGTON, D. C.—Proposals for rate increases, ranging from 3 to 7 cents per 100 lb., on rail shipments of crude and fuel oil have been filed with the Interstate Commerce Commission by the Association of American Railroads. The proposed increases, which would become effective November 1 and which would supplant the existing emergency rates on petroleum products which expire except for gasoline, October 31, would add $50,000,000 annually to the cost of oil transportation by rail.

Emergency rates on gasolines, including kerosene, natural-gasoline blends, and other refined oils with average weight of 6.6 lb. per gallon, are extended unchanged for another year from October 31. However, the proposed new rates call for increases on naphtha and casinghead gasoline greater than those planned for crude and fuel oil, but the movement on these products, according to the carriers, is minor.

The oil industry and various interested governmental agencies are allowed 45 days, 15 more than the required statutory notice, to file protests if desired. Protests are expected from the Office of Petroleum Coordinator, Office of Price Administration and the Office of Defense Transportation.

As set up in the proposal of the carriers, the rates prescribed by ICC in 1930 in No. 17,000, Part 4, the normal petroleum-rate basis, are docked 25 per cent, then increased by the measure of the changes allowed in the ex parte 123 rate case, giving the current emergency rate basis (which is retained on gasoline). Then the increases allowed last March in ex parte 148 are added, and 85 per cent of this figure forms the proposed fuel-oil rate. For crude, 82 per cent of the resulting figure is assessed.

Maximum over the changes is 16 per cent of first-class rates, as compared to the ceiling of 13 per cent over first class.

If the increases are allowed, it is considered probable that the Reconstruction Finance Corp. will extend its subsidy, which is provided for abnormal transportation costs, to include the increased rates, so that the increases may not be reflected in additional burdens to the oil industry and consumer costs.

# Peak Demand Expected By California Operators

By L. P. STOCKMAN

LOS ANGELES, Calif.—All indications point to the probability that the 1942 demand for petroleum products in Pacific Coast territory, including Army and Navy requirements in both domestic and foreign fields, will set a new record. And there is a strong possibility that 1943 demand will exceed current requirements by a wide margin. Gasoline consumption, owing to less driving and a progressively diminishing number of automobiles in service, will continue a declining trend during the remainder of 1942. The drop may not be as large as anticipated because of extensive purchases of motor fuel by the military forces and the amount allocated for lease-lend aid. Aviation gasoline production will continue to increase and production of synthetic rubber should become a factor early in 1943. Fuel-oil demand can be expected to continue climbing due to ever-increasing railroad requirements. Railroads in Pacific Coast territory are normally the largest single users of fuel oil. Since the start of the war, railroad consumption has shown a tremendous increase incident to the movement of troops and supplies. Bunker fuel has also been a large item at Pacific Coast ports, but this business has been practically eliminated. Increased Navy consumption, however, will offset a large part of the decline shown in the bunker-oil classification. Fuel oil for heating purposes, which usually runs around 10,000,000 bbl. annually, will be up in 1942 as numerous hotels and large establishments converted from natural-gas furnaces some time ago in order to assure satisfaction of home-heating requirements. Fuel-oil consumption in the smelting industry will continue at normal levels, but the amount normally used by various manufacturing industries will be substantially higher owing to war work and the fact that this type of consumption, in many cases, has been converted to oil from natural gas.

### Demand Up 5.84 Per Cent

The demand for all petroleum products during the first 7 months of 1942 is 5.84 per cent above consumption for the same time last year. During the first 7 months of 1942, gasoline, gas oil and diesel demand was below last year, but fuel oil, on the other hand, showed a gain in consumption of 22.93 per cent. California appears able to produce enough light oil to meet probable gasoline demand. But, under present conditions, operators are unable to produce enough heavy crude to meet the constantly increasing demand for fuel oil. Demand for fuel oil has consistently exceeded production for the past several years. Stocks have been reduced 27,616,154 bbl. since January 1, 1939. Fuel-oil stocks have been reduced during each of the past 4 years and, during the first 7 months of 1942, inventory withdrawals totaled 9,879,921 bbl. During the past 4 years, stocks of heavy crude have been reduced 5,323,627 bbl.

Production and stocks of heavy crude oil in California are approaching a critical stage and corrective measures must be launched to rectify a condition that demands early attention. Under normal conditions, present stocks would prove ample because commercial accounts do not demand as high-quality fuel oil as the Navy and certain other preferred industries. Navy specifications are rigid and, among other things, call for a viscosity of 25, a pour point of 15°, minimum sulfur and high B.t.u. values. While there are 43,155,727 bbl. of fuel oil and 10,950,550 bbl. of heavy crude in storage only a portion of these can be used to produce a fuel oil that will meet Navy specifications. The latest monthly report of the Bureau of Mines reveals that the combined demand for fuel oil and heavy crude aggregates 352,323 bbl. per day, almost half of the state's current crude-oil production. Stocks of fuel oil and heavy crude represent 153 days' supply at the present rate of consumption.

Although no data has been released with respect to probable Navy requirements for fuel oil along the Pacific front, it might reach or exceed 25,000,000 bbl. during the next fiscal year. It is highly unlikely that marketers could make available anything near that amount of special fuel oil from current operations and stocks. It is necessary, therefore, to increase production of heavy grades of crude oil in the immediate future. Wells producing heavy crude in California are all small and therefore it is not possible to greatly stimulate production without extensive preparations. It takes time to recondition a well that has been neglected for a number of years because the lifting cost exceeds the price received for current production. The quickest way to step up heavy-crude production is through the reconditioning of present wells. This is especially important because this method would require a minimum of critical materials.

### Field Work Hampered

The present price of heavy crude is so low that operators are unable to undertake necessary remedial work and proceed with the usual clean-out jobs that must be done frequently to maintain efficient production. All producers of heavy crude recognize this condition especially those operators in fields that make large amounts of sand and water. The present price of heavy crude is approximately 15 cents per barrel below lifting costs in fields producing the heaviest grades. To provide adequate current revenue which will permit operators to undertake necessary work will require an increase of 25 cents per barrel for the heavier grades and a progressively smaller rise for lighter grades up to and including 23.9-gravity.

The price of heavy crude oil has been substantially below parity for several years and reflects the fact that most of the discoveries during the past 10 years have been fields that produce a light grade of refinable oil. Obviously in these newly discovered fields, production costs have been relatively low especially during the flush stage. This was during a period when demand for gasoline was high and that for fuel oil somewhat restricted. Naturally, operators concentrated on flush fields that produced a higher-priced crude and where lifting costs were lower to the detriment of the settled heavy-crude fields. Conditions have changed, however, and refiners are now interested in maximum yields of heavy oil. There can be no improvement until the Office of Price Administration recognizes conditions and permits a price increase sufficient to allow operators to rejuvenate productive properties from current income. Uneconomic marketing practices have likewise adversely affected producers of heavy crude oil as is evidenced by the fact that suppliers reduced the price of heavy crude in January 1940 in the face of an increasing demand for fuel oil and during a priod when stocks were being reduced. The heavy-oil market has never recovered from this action which can be attributed to overzealous competition.

The District 5 production committee, recognizing the urgent necessity of increasing crude production in order to raise yields of fuel oil, has lifted all curtailment obligations in fields producing low-gravity oil. The committee also increased the quotas of fields producing crude yielding substantial amounts of residuum.

### Fuel Stocks Reduced

Recently, it was brought out that California companies reduced fuel-oil storage approximately 55,000 bbl. per day during the first 6 months of the year and it was decided that something must be done immediately to arrest this trend. Accordingly, the production committee upset precedent by increasing the state quota for August 23,800 bbl. per day in the middle of the month in order to provide additional fuel oil. This increased allotment was made retroactive to August 15 and raised the state's allotment for the last 16 days of August to 750,000 bbl. daily. This increase was allocated entirely on the fuel-oil aspects of the various pools. Fields producing crude with small residuum yields did not receive added allotments. The daily quota for September was retained at the 750,000-bbl. rate. Only fields and pools yielding crude with high percentages of residual fuel were given increased allotments. There is little possibility of replenishing fuel-oil stocks, but it is necessary to maintain sufficient inventory to guarantee delivery when needed and in the amount required.

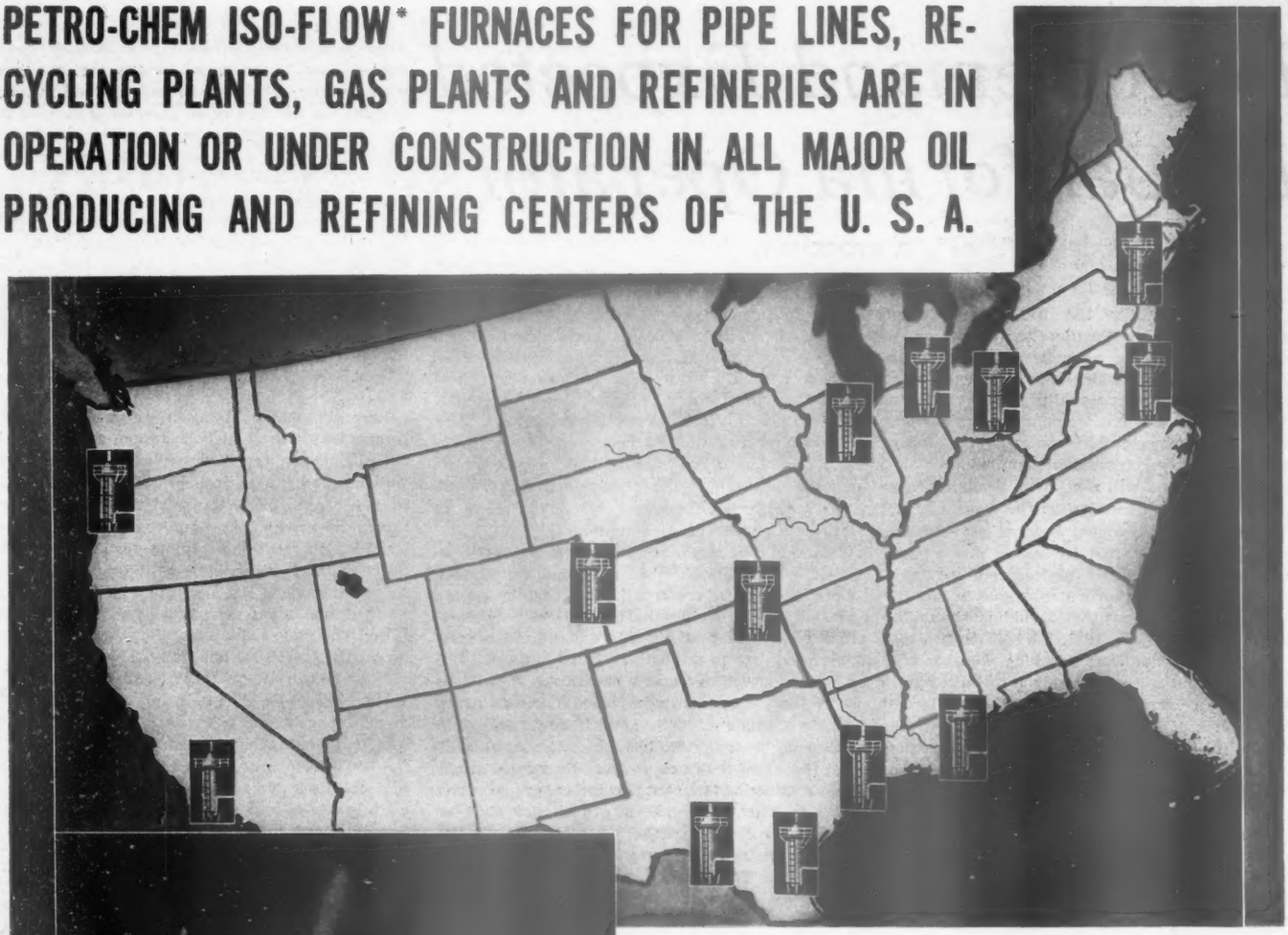
Contracts for fuel oil for 1943 will be negotiated by refining companies within another month or so and for this reason it is urgently necessary that the status of heavy crude be determined in the immediate future.

A base price of $1 per barrel for fuel oil and an upward adjustment in quotations on heavy crude would prove beneficial. The time is near when it will be necessary to protect the Navy against inadequate supplies.

Peak production of heavy crude was reached some time ago and from now on a normal decline may be anticipated unless operators maintain properties at peak efficiency. The California office of the OPC, earlier this year, recognized an impending shortage of fuel oil and undertook a survey to determine the best method to step up production of heavy crude as the basic supply factor. This survey recommended immediate steps "as the rehabilitation of heavy-crude wells is the quickest means of securing additional heavy-crude-oil production and because many of the proposed projects require a relatively small amount of steel to secure this additional production."

The California office of OPC, in addition to recommending immediate reconditioning work, suggested that many new wells should be drilled to meet the growing need for heavy crude. The office found 2,685 locations available in existing fields that could be drilled whenever material was procurable. The California industry, its leaders content, could not drill 2,685 new wells or even a part of that number because: (1) There are not enough competent drillers and crews available; (2) there is not enough material to permit any such amount of work; (3) the present price of heavy crude oil is too low to justify such extensive work; and (4) some of the fields are located in areas where production could not be moved readily to refining centers.

# PETRO-CHEM ISO-FLOW* FURNACES FOR PIPE LINES, RECYCLING PLANTS, GAS PLANTS AND REFINERIES ARE IN OPERATION OR UNDER CONSTRUCTION IN ALL MAJOR OIL PRODUCING AND REFINING CENTERS OF THE U. S. A.



*Trade Mark. Patents issued and pending.

PETRO-CHEM ISO-FLOW* Furnaces are prefabricated for portability...operate with low pressure drop and high efficiency...occupy negligible ground space and are ideal for pipe line service.

In producing and refining centers of the U. S. A. PETRO-CHEM ISO-FLOW* Furnaces are fulfilling every exacting requirement for any heating service, capacity or duty.

In vital defense work PETRO-CHEM ISO-FLOW* Furnaces are being used for the manufacture of Aviation Gasoline, Butadiene and Styrene. They are proving their special adaptability for high temperature processing.

**SAVE CRITICAL MATERIALS**

PETRO-CHEM ISO-FLOW* FURNACES save 30 to 50% in critical materials, eliminate furnace maintenance and fulfill all process requirements, efficiencies and mechanical standards. They require less than half the overall steel—50% less alloys—35% less headers—30% less furnace tubes—50% less refractories—40% less foundations—no independent stack and 75% less ground space.

**PETRO-CHEM DEVELOPMENT CO.**
INCORPORATED
120 EAST 41st STREET, NEW YORK, N. Y.

*Representatives*
FAVILLE-LEVALLEY CORP. Marquette Bldg., Chicago
BETHLEHEM SUPPLY CO. Tulsa, Houston, Los Angeles

# Californians Ask 22-Cent Advance for Heavy Crudes

A SCHEDULE of increased prices for California heavy crude has been filed with the Office of Price Administration by the California heavy crude-oil committee. Approval of the schedule, which establishes a minimum price of approximately 93 cents per barrel for fuel-oil-yielding California crudes, with an average increase of approximately 22 cents per barrel on crudes of 15° gravity, is sought as a stimulus to increased development of heavy crudes, critically needed to supply fuel oil for war demands.

"The schedule is supported by a petition which thoroughly explores the California heavy crude-oil situation, and is based solely on the need for additional heavy crude production," according to W. H. Morgan, chairman of the committee which prepared the schedule and the petition.

"Demand for California fuel oil, which increased from a total of 279,000 bbl. per day during the first 7 months of 1941 to 343,000 bbl. per day during the like period of 1942, with further increases in prospect as military and war industry demands increase, makes it imperative that California operators exert every effort to increase production of low gravity crudes, the raw materials from which fuel oil is made. Operators cannot develop such production, however, until and unless prices for the crude are sufficiently high to carry development costs," Mr. Morgan said.

The petition for an adjustment of prices to the levels requested shows that cost of developing new heavy crude-oil production in the state would average 75.1 cents per barrel, while the present weighted average selling price for the same oil is 71.7 cents per barrel. Resultant loss is 3.4 cents per barrel.

"The figures come from government sources," Mr. Morgan said. "The amount of oil to be produced, and the number of wells needed to produce it, were taken from a recent survey by the District 5 Office of the Petroleum Coordinator, while production cost figures were taken from a report of the U. S. Tariff Commission. Development cost figures were compiled from current drilling costs in the fields indicated."

Costs set forth in the survey are based upon operating charges up to the end of the third quarter of 1941, the date of the Tariff Commission survey, and do not reflect increases in prices of materials, in wages, and in services since that time. They do not include interest on the investment required, which, if considered, adds an average cost of 7.4 cents per barrel, bringing the total loss per barrel of oil to be produced under the proposed development program to 10.8 cents per barrel.

The proposed price schedule would increase the price of 15-gravity oil by an average of 22 cents per barrel, with progressively lower increases as gravities increase. It is based upon current price schedules, thus maintaining present differentials between fields. It does not propose any increase in the price of higher gravity oils.

Present prices for heavy crudes range from 69 to approximately 85 cents per barrel. Under the proposed schedule, lower price brackets would be increased to approximately 93 cents per barrel, remaining at that level as gravities increased until the price thus determined reached the level of current postings. For example, in a field in which present prices are 71 cents per barrel for 15-gravity crude, increasing to 94 cents per barrel for 21 gravity, the proposed price is 93 cents per barrel for 15-gravity crude, remaining at that level through 20 gravity, present prices to be retained for crudes of 21 gravity and higher.

"The proposed schedule would, on the average, result in a possible profit of 11.2 cents per barrel on the oil to be developed under the proposed drilling program. However, this profit is calculated on the assumption that all of the 2,685 wells proposed in the OPC survey will be successful, which is doubtful. If any of them should fail to produce, the average cost of successful wells would be increased. The profit indicated, therefore, seems to the committee to be more than a reasonable insurance against the hazards associated with drilling," Mr. Morgan said.

## Gasoline Rationing Not Expected Before Nov. 15

WASHINGTON, D. C.—The Office of Price Administration is planning on starting the national rationing of gasoline about November 15, according to reports here. Much preliminary work remains to be done in preparing registration forms and procedure before the program can start.

The details of the plans to apply national rationing must await instructions from Rubber Administrator Jeffers. These are expected in a few days.

## OPC Working on Production Of Heavy Oil in California

WASHINGTON, D. C.—A new plan to increase the production of heavy oil in California is being worked out by the Office of Petroleum Coordinator and the War Production Board which probably will be issued shortly as Conservation Order M-68-3.

Some weeks ago OPC drew up a plan for increasing drilling for heavy oil in some 85 fields in California, but WPB declined to approve the use of the amount of steel estimated to be required. It is understood that the new plan will not permit the drilling of new wells at this time but will provide for reworking fields by plugging back and reconditioning existing wells on spacing patterns of 5 and 10 acres instead of the 40-acre spacing generally applicable under M-68.

# DEATHS

**FRANK A. HAUGH,** 68, pioneer Mid-Continent oil man and father of Ted A. Haugh, attorney for Mid-Continent Petroleum Corp., died at his home in Tulsa last week following a heart attack the preceding week.

**SIDNEY J. RATCLIFFE,** 49, director and treasurer of the Peoples Natural Gas Co., New York State Natural Gas Corp. and Keuka Construction Corp., and a director of Lycoming Producing Corp. and Lycoming United Gas Co. of New York, died in a Pittsburgh, Pa., hospital last week after a short illness. He was a native of Buffalo, N. Y., and became associated with Peoples Natural Gas Co. in July 1912. He is survived by his widow, a son and a brother. He was a member of the accounting section of the American Gas Association and chairman of the accounting committee of the Pennsylvania Natural Gas Men's Association.

**LEWIS S. CORYELL,** 48, district geologist, Cities Service Oil Co., Wichita Falls, Tex., died unexpectedly at his home last week following a heart attack. He recently had been transferred to Wichita Falls from Midland, Tex., to which city he had moved the year previous from Bristow, Okla. He is survived by his widow, a son, a daughter, and an adopted daughter.

**PERRY FORKER,** 94, early day drilling contractor in the Ohio oil fields, died last week at his home in Gibsonburg, Ohio. He was a native of Rockland, Pa., moving to Ohio about 40 years ago.

**U. S. (CURLY) DITTMAN,** 77, pioneer driller in Pennsylvania, Texas and the Mid-Continent, died of a heart attack September 15 in a Tulsa hospital. He was born in Clarion County, Pennsylvania, and drilled in several of the early eastern fields. Since retirement Mr. Dittman had made his home in Tulsa. A son, J. L. Dittman, Tulsa, is among survivors.

## October Production Quotas Total 4,066,200 Bbl. Daily

WASHINGTON, D. C.—Daily petroleum production rates recommended by the Office of Petroleum Coordinator for October total 4,066,200 bbl. for the United States. A drop of only 6,900 bbl. from certified September quotas but nearly 200,000 bbl. below actual daily production in October 1941.

The drop in October certifications reflects anticipated demand for motor gasoline owing to rubber conservation measures. Most of decrease applies to Illinois and California. Illinois has been unable to produce certified rates and is cut 9,200 bbl. California's quota is 9,500 bbl. below original September certification of 791,500 bbl., but this was later cut to 779,533 so the October rate is a slight increase over the adjusted rate.

Texas' certification is an increase of 9,800 bbl. over September owing to increased needs for certain types of crudes for war products.

**OPC CERTIFIED PRODUCTION QUOTAS**

| | Ttl. pet. liquids | |
|---|---|---|
| | Oct. | Sept. |
| District 1: | | |
| New York | 15,400 | 15,200 |
| Pennsylvania | 50,800 | 52,300 |
| West Virginia | 16,000 | 16,600 |
| Total | 82,200 | 84,100 |
| District 2: | | |
| Illinois | 280,000 | 289,200 |
| Indiana | 19,000 | 19,300 |
| Kansas | 294,000 | 291,900 |
| Kentucky | 13,800 | 14,000 |
| Michigan | 65,700 | 66,700 |
| Nebraska | 3,500 | 3,900 |
| Ohio | 11,400 | 11,200 |
| Oklahoma | 417,000 | 415,300 |
| Total | 1,104,400 | 1,111,500 |
| District 3: | | |
| Arkansas | 79,500 | 81,900 |
| Louisiana | 337,200 | 334,800 |
| Mississippi | 50,000 | 50,200 |
| New Mexico | 101,100 | 98,100 |
| Texas | 1,407,600 | 1,397,800 |
| Total | 1,975,400 | 1,962,800 |
| District 4: | | |
| Colorado | 7,000 | 7,000 |
| Montana | 24,400 | 22,800 |
| Wyoming | 90,800 | 93,400 |
| Total | 122,200 | 123,200 |
| District 5: | | |
| California | 782,000 | 791,500 |
| Total United States | 4,066,200 | 4,073,100 |

# Natural Gasoline

## Production Rate Constant At 219,000 Bbl. per Day

Daily average production of natural gasoline and allied products in July remained constant at 219,000 bbl. daily, the Bureau of Mines reported last week. Total July production of 6,804,000 bbl compares with output of 6,558,000 bbl. in June but the longer month maintained the daily average at a constant rate.

Production increases were reported from Louisiana, New Mexico and California with decreases shown in Oklahoma and East Texas operations. Demand for natural gasoline and allied products in July averaged 233,000 bbl. daily, the Bureau of Mines reported. This indicated consumption compares with 238,000 bbl. daily in June and with 226,000 bbl. daily in July 1941.

Stocks of products in this classification increased slightly to 6,773,000 bbl. at the start of August compared to 6,721,000 bbl. on July 1. On August 1, 1941, the stocks of natural gasoline and allied products totaled 6,317,000 bbl.

Production of isobutane at natural gasoline and cycle plants in July totaled 240,000 bbl., against 226,000 bbl. in the previous month. Production of liquefied petroleum gas totaled 1,205,000 bbl. in July, compared to 1,213,000 bbl. in June. Liquefied refinery gas production at refineries during the month totaled 491,000 bbl., compared to 501,000 bbl. in June.

**PRODUCTION OF NATURAL GASOLINE AND ALLIED PRODUCTS**
(Thousands of gallons)

| | July, 1942 | June, 1942 | Jan.-July, 1942 | Jan.-July, 1941 |
|---|---|---|---|---|
| W. New York | 1 | 1 | 8 | 8 |
| W. Pennsylvania | 744 | 776 | 9,253 | 8,664 |
| West Virginia | 8,663 | 6,579 | 56,579 | 39,456 |
| Ohio | 300 | 348 | 4,086 | 4,458 |
| Illinois | 11,561 | 11,138 | 77,207 | 27,662 |
| Kentucky | 2,522 | 2,586 | 13,564 | 5,355 |
| Michigan | 256 | 243 | 1,514 | 2,316 |
| Kansas | 5,598 | 5,275 | 44,784 | 41,473 |
| Oklahoma | 36,879 | 36,466 | 255,447 | 216,459 |
| Texas | 128,615 | 124,665 | 912,464 | 639,413 |
| Gulf | 29,298 | 28,120 | 215,432 | 153,327 |
| East Texas | 23,771 | 24,042 | 160,208 | 99,371 |
| Panhandle | 35,312 | 33,742 | 245,102 | 164,075 |
| Other | 40,234 | 38,761 | 291,722 | 222,640 |
| Arkansas | 3,712 | 3,580 | 23,346 | 20,061 |
| Louisiana | 24,683 | 23,798 | 167,370 | 67,652 |
| Gulf | 5,923 | 5,093 | 38,060 | (*) |
| Inland | 18,760 | 18,705 | 129,310 | (*) |
| New Mexico | 7,558 | 6,845 | 49,006 | 35,071 |
| Colorado | 68 | 15 | 162 | 173 |
| Montana | 261 | 379 | 2,620 | 1,546 |
| Wyoming | 2,916 | 2,754 | 20,356 | 20,466 |
| California | 53,431 | 49,988 | 361,977 | 334,433 |
| Total | 285,768 | 275,436 | 1,999,746 | 1,464,666 |
| Daily average | 9,218 | 9,181 | 9,433 | 6,909 |
| Total (thousands of barrels) | 6,804 | 6,558 | 47,613 | 34,873 |
| Daily average | 219 | 219 | 225 | 164 |

*Unavailable.

## Decrease Shown in Gasoline Plant Operations for Texas

Natural-gasoline plants in Texas processed 2,321,292,000 cu. ft. of gas daily during July, according to the monthly summary of operations by the Railroad Commission just issued. This was 35,863,000 cu. ft. less than the daily average gas throughput reported for June.

Production from these plants during June averaged 69,974 bbl. daily, a decrease of 8,890 bbl. from the June report. In July 148 plants were in operation while in June there were 147.

The detailed summary of operations showing gas intake by sources, the disposition of residue gas and the production by products follows:

**TEXAS NATURAL-GASOLINE OPERATIONS**

| | July | June |
|---|---|---|
| Intake (1,000's of feet daily): | | |
| Casinghead gas | 842,540 | 884,441 |
| Dry sweet gas | 862,921 | 851,605 |
| Dry sour gas | 601,293 | 604,414 |
| Refinery vapors | 14,538 | 16,695 |
| Total gas | 2,321,292 | 2,357,155 |
| Residue disposition (1,000's of feet daily): | | |
| Extraction loss | 134,435 | 140,936 |
| Return to leases | 95,203 | 125,923 |
| Plant use | 192,217 | 184,527 |
| Repressuring | 163,243 | 175,238 |
| Carbon black | 805,341 | 813,295 |
| Pipe line | 717,234 | 705,253 |
| Gas lift | 37,189 | 30,936 |
| Vented | 176,430 | 181,047 |
| Total | 2,321,292 | 2,357,155 |
| Production (barrels daily): | | |
| Gasoline | 57,759 | 64,149 |
| Butane-propane | 10,512 | 14,093 |
| Other products | 1,703 | 612 |
| Total | 69,974 | 78,864 |

## Committee Formed to Plan Part in Technical Operations

A new technical advisory group created for the purpose of correlating rapidly advancing refining and chemical technology with natural gasoline and distillate operations has just been announced by Ray E. Miller, Hanlon-Buchanan, Inc., Tulsa, president of the Natural Gasoline Association of America.

R. C. Alden, director of research, Phillips Petroleum Co., Bartlesville, Okla., is chairman of the new committee. Serving with him will be: H. H. Beeson, Sabine Valley Gasoline Co., Shreveport, La., who is also chairman of the N.G.A.A. technical committee; H. E. Felt, Warren Petroleum Corp., Tulsa; O. L. Roberts, Atlantic Refining Co., Philadelphia, Pa., and C. R. Williams, the Chicago Corp., Corpus Christi, Tex.

Chairmen and vice chairmen of other N.G.A.A. committees recently announced are: Economics: H. E. Felt, Warren Petroleum Corp., Tulsa; Henry Clark, J. S. Abercrombie Co., Houston. Gas contract: G. T. Tennison, Shell Oil Co., Inc., Houston; Ralph A. Worley, the Parade Co., Shreveport, La. Gas testing: H. L. Oder, Cities Service Oil Co., Bartlesville, Okla.; R. H. Clark, Phillips Petroleum Co., Bartlesville. Legal: W. J. Holleman, Glen Rose Gasoline Co., Tulsa; H. K. Hudson, Phillips Petroleum Co., Bartlesville. Research and educational: J. W. Vaiden, Skelly Oil Co., Tulsa; W. L. Bowser, Atlantic Refining Co., Dallas. Specifications and outage: F. B. Haverfield, Continental Oil Co., Ponca City; Phil D. Baker, Carter Oil Co., Tulsa. Technical: Mr. Beeson; M. R. Church, Shell Oil Co., Inc., Houston. Traffic: W. A. Rowsey, Lone Star Gasoline Co., Dallas; W. H. Anders, Coltexo Corp., Monroe. Divisional: Mr. Williams, and J. R. Butler, Cotton Valley Operators Committee, Cotton Valley, La.

## ALABAMA GAS LINE . . .

*Ditching for the construction of a recent pipe line for the Southern Natural Gas Co.*

# Recycling News

## Texas Cycling Plants Boost Gas Intake and Production

Gas-cycling plants of Texas handled 1,289,059,000 cu. ft. of gas daily during July, according to the monthly report of the Railroad Commission just compiled. This represented an increase of 45,289,000 cu. ft. in the daily average volume processed during the preceding month.

Daily average recovery of liquid products from this gas for the month totaled 32,925 bbl., an increase of 1,012 bbl. over the daily average recovery for June. The report covered 27 plants for both months.

Gas intake by sources, recovery of liquids by products and disposition of the residue gas are shown in the accompanying tabulation.

**TEXAS RECYCLING-PLANT SUMMARY**

| | July | June |
|---|---|---|
| Intake (1,000's of feet daily): | | |
| Casinghead gas | 3,240 | 3,743 |
| Dry gas | 1,285,819 | 1,240,027 |
| Total gas | 1,289,059 | 1,243,770 |
| Residue disposition (1,000's of feet daily): | | |
| Extraction loss | 44,109 | 37,752 |
| Return to leases | 3,110 | 717 |
| Plant use | 41,955 | 42,055 |
| Drilling | 11,015 | 10,789 |
| Pipe line | 76,729 | 78,403 |
| Gas lift | 731 | 277 |
| Recycled | 1,097,270 | 1,056,978 |
| Vented | 14,140 | 16,799 |
| Total | 1,289,059 | 1,243,770 |
| Production (barrels daily): | | |
| Crude condensate | 12,112 | 11,938 |
| Gasoline | 15,834 | 15,709 |
| Butane | 2,530 | 2,314 |
| Other products | 2,449 | 1,952 |
| Total | 32,925 | 31,913 |

# PIPE LINE

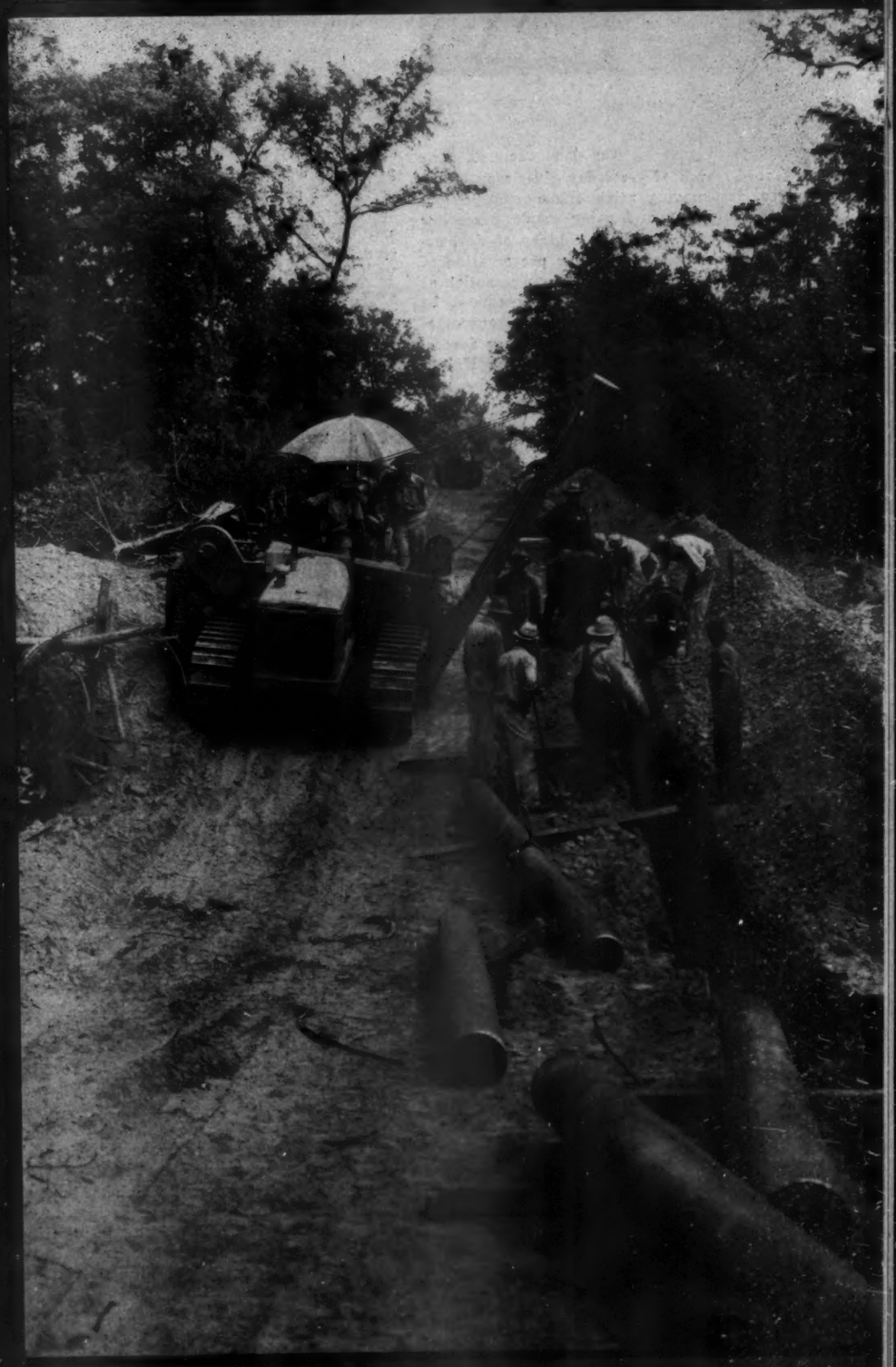
## SECTION

A REPORT ON

THE PROGRESS AND

DEVELOPMENTS IN

NEW PRACTICES



# War Has Imposed an Enormous Burden on Nation's Oil Arteries

By W. ALTON JONES*

THE technique of war has changed. The forced march of yesterday gives way to the modern, fast-moving army transported in motorized equipment and using man's peacetime servant—gasoline—to drive engines of destruction in self defense and for the preservation of our democratic way of life. But, essential as these machines have become, they cannot be employed without the all-important transportation system behind them. Our military forces, as well as substantial segments of the United Nations, are depending upon us for the machines and for the life blood—petroleum—to keep them functioning.

Our men at the battle fronts, wherever they may be, in the air, on land or on the sea, *must and will have oil.* On our home front, our vitally important war activities; mobility of war workers; the health and reasonable comfort of millions of our people are all dependent to a great extent on having an adequate supply of petroleum products when and where needed.

Nature has given the people of the United States generous supplies of crude oil and natural gas. Freedom of enterprise has made possible the extensive development of these resources. Petroleum-industry scientists and technicians have made rapid progress in the art of refining and utilization of the products of petroleum. Under a peacetime economy, the industry developed a highly efficient and fully adequate transportation system but the demands and events of war have caused serious dislocations and are placing tremendous burdens on this system.

### Aggravated by Tanker Diversion

In the highly industrialized East, where, in prewar days, 95 per cent of the petroleum required was delivered by ocean tanker, the real importance of transportation has been thrown into bold relief. Diversion of tankers for military and lend-lease activities in 1941 and subsequent enemy action along the Atlantic seaboard and the Gulf of Mexico, reduced the normal movement of petroleum for eastern delivery from a daily average of 1,500,000 bbl. to a small fraction of that quantity.

The problem created by this disruption of normal transportation was not wholly unanticipated as, early in 1941, the Petroleum Coordinator for National Defense and the petroleum industry collaborated on plans to offset the declining supply of oil for the East. Plans were perfected whereby 11 companies, doing in excess of 85 per cent of the total oil business in the East, agreed to privately finance, construct, and operate emergency pipe lines, extending from the oil fields of the Southwest to New York and Philadelphia. At the time these plans were reduced to formal signed contracts, Reconstruction Finance Corp. agreed to loan up to 80 per cent of the cost of building the lines. Unfortunately, the necessary critical materials were not made available and the plans to build the new oil pipe lines were deferred.

### Survey Transportation Facilities

Early in 1942, as the eastern supply situation grew more acute, the Office of Petroleum Coordinator for War and industry committees appointed by him and by the Petroleum Industry War Council made comprehensive surveys of existing transportation facilities for the purpose of utilizing every possible means to make maximum deliveries of petroleum into the eastern area, *regardless of cost.* The attack on this problem and the rapid strides which have been made in its solution have developed a most commendable and highly cooperative working between Government and industry. Individual interests have been freely subordinated and sacrificed in a spirit of patriotism for the defeat of time and the enemies of our country.

The challenge to American ingenuity has been accepted in the field of transportation by our railroads, currently moving some 70,000 tank cars in eastern service which, in mid-August, were making deliveries at the rate of 830,000 bbl. daily; by the operators of inland waterway facilities; by the industry owners of oil pipe lines in the East and in the West, and, by Government in making possible the construction of new pipe lines; all factors contributing every effort to augment the supply of oil for the eastern states. Oil pipe-line systems are being revamped; capacities increased; some crude oil, gasoline, and products lines are being reversed, so that the direction of flow will be eastward instead of westward as originally designed and operated, and wherever possible, pipe is being reclaimed from existing systems to be reinstalled for eastern service.

Despite the excellent work which has been and is currently being done by the railroads and the petroleum industry in effectuating the foregoing changes, it has been fully appreciated that these steps would only partially alleviate the shortage in the East.

Recognition of the need for doing more resulted in the War Production Board making an allocation of sufficient critical materials and Reconstruction Finance Corp. furnishing the necessary funds for constructing the first section of the 24-in. emergency pipe line from Texas to the East Coast. This emergency line is being constructed for the Government by War Emergency Pipelines, Inc. The first section of the emergency line will only reach southern Illinois from which temporary terminus oil will then be moved the remaining distance to the East by tank car and barge. The line will have a capacity of 300,000 bbl. per day but the effect, in terms of deliveries to the East, because of intervening tank-car haul, will only reflect an average increase of about 125,000 bbl. per day.

It is evident that the real benefit to the East will materialize when the emergency line is extended to the Atlantic seaboard. The Office of Petroleum Coordinator for War and the industry regard this extension as being vitally necessary to our war effort. Furthermore, it can be conclusively demonstrated that the completion of this line represents the most efficient expenditure of critical material for the purpose of supplying oil to the vitally important war production centers of the East and for the transportation of oil to the fighting fronts.

### Natural-Gas Needs Expanded

In the natural-gas industry the war has created demands which have made necessary the expansion of transportation facilities. New industries for the production of war materials have been built where the availability of natural gas for fuel was one of the important factors in determining the location of the plants. The increased demands for natural gas thus created, required extension of lines and increases in the capacity of plants already installed. Many of these changes had to be made with a minimum expenditure of new critical materials. Systems have been canvassed and wherever possible, pipe and other equipment have been reclaimed in order to assure the war plants of a fuel supply.

Somewhat comparable to necessary governmental restrictions in the sale of petroleum products in the East is the present position of natural-gas companies who are unable to connect new domestic outlets or industries not engaged in war production activities.

While the war-created problems in the field of transportation are many and complex, I have no doubt as to their successful solution. Men in the industry and the Government, thoroughly conversant with the problems, are giving their best toward this end.

---

*President, Cities Service Co.; president, War Emergency Pipelines, Inc.; chairman, National Transportation Committee; chairman, Pipeline Management Committee; chairman, Temporary Joint Pipeline Managing Subcommittee.

# INDUSTRY EXECUTIVES ACTIVE IN NATIONAL PIPE-LINE PROGRAM

W. R. FINNEY

B. E. HULL

C. H. KOUNTZ

E. HOLMAN

L. M. GOLDSMITH

CHARLES BUNJE, JR.

WILBUR F. BURT

F. W. ABRAMS

ONE of the largest pipe-line construction programs in the history of the petroleum industry is now being carried out through cooperation of operators with government authorities to increase flow of crude oil and refined products to relieve the East Coast shortage resulting from the curtailment in marine shipping.

Outstanding results have been accomplished by executives of the petroleum industry working as members of Temporary Joint Pipe Line Managing and Engineering subcommittees as well as committees of individual projects. Membership of these committees is shown on Page 186 of this issue. In conjunction with OPC, WPB, and RFC an effort has been made to solve problems by the utmost utilization of existing pipe-line resources and the minimum expenditure of steel for new pipe.

Active projects are: Project 1—Increase crude movement from Texas by enlarging and revamping present systems; Project 2—Increase Plantation system; Project 3—Construct Tiffin-Akron, Ohio, products line and reverse Sun-Susquehanna system; Project 4—New York and Pennsylvania products-line program including full utilization, certain reversals, as well as increase of lake-tanker movement of products to Buffalo, N. Y.; Project 5—Construct El Dorado-Helena, Ark., line for Gulf Coast-Misissippi River products system; Project 9—War Emergency Pipelines, Inc.'s 550-mile 24-in. Texas-Illinois crude-oil line which is the first part of a system to be extended to New York and Philadelphia refining centers.

***W. R. FINNEY**, manager of pipe-line operations, Standard Oil Co. (New Jersey); chairman of Temporary Joint Pipe Line Engineering Subcommittee; chairman, Engineering Subcommittee, Project 9; Advisory Committee for War Emergency Pipelines, Inc. **C. H. KOUNTZ**, vice president, Sinclair Refining Co.; in charge of part of Project 4; member of Advisory Committee for War Emergency Pipelines, Inc. **L. M. GOLDSMITH**, vice president, Atlantic Refining Co.; Project 9, and member of Advisory Committee for War Emergency Pipelines, Inc. **W. F. BURT**, chairman, manufacturing committee, Socony-Vacuum Oil Co., Inc.; Project 4. **ALEX FRASER**, president Shell Oil Co., Inc.; chairman, Project 3. **H. H. ANDERSON**, vice president, Shell Pipe Line Corp.; in charge of design and construction of Bayou Pipe Line System of Project 2. **T. E. SWIGART**, president, Shell Pipe Line Corp.; manager of Bayou Pipe Line System of Project 2. **C. M. ROSEBRUGH**, chief engineer, Gulf Oil Corp., Houston Pipe Line Division; Projects 5 and 9. **F. E. WARTERFIELD, JR.**, vice president, Plantation Pipe Line Co.; Project 2. **A. W. PEAKE**, vice president, Standard Oil Co. (Indiana); Project 1. **S. S. SMITH**, manager of products pipe lines, Shell Oil Co., Inc.; Project 3. **A. N. HORNE**, manager, Empire Pipeline Co.; vice president and general superintendent, War Emergency Pipelines, Inc. **F. W. ABRAMS**, director, Standard Oil Co. (New Jersey); Project 2. **C. BUNJE, JR.**, president, Illinois Pipe Line Co.; Project 1. **E. HOLMAN**, vice president, Standard Oil Co. (New Jersey); Project 5. **B. E. HULL**, president, Texas Pipe Line Co.; vice president and general manager, War Emergency Pipelines, Inc.; Project 9. **G. F. HANKS**, president, Tide Water Pipe Co.; member of Temporary Joint Pipe Line Engineering Subcommittee. **R. B. McLAUGHLIN**, vice president, Texas Pipe Line Co.; formerly associate director of Transportation Division, Office of Petroleum Coordinator. **J. F. DRAKE**, president, Gulf Oil Corp.; Project 5. **H. C. WIESS**, president, Humble Oil & Refining Co.; member of Temporary Joint Pipe Line Managing Committee.*

ALEX FRASER

GEORGE J. HANKS

R. B. McLAUGHLIN

J. FRANK DRAKE

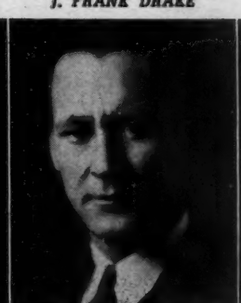
HARRY C. WIESS

A. N. HORNE

H. H. ANDERSON

T. E. SWIGART

C. M. ROSEBRUGH



F. E. WARTERFIELD, JR.

A. W. PEAKE

S. S. SMITH

# New Practices Improve Crude And Products Line Operation

By JOHN G. NORTON
Chief Mechanical Engineer, Magnolia Pipe Line Co.

**Certain operating problems encountered in the operation of a major system including crude-oil, gasoline and butane pipe lines are discussed with special attention given to automatic control of pumping as well as improved practices connected with details of different types of reciprocating pumps. Of particular interest are the author's comments on the significance of scrapers in the operation of crude-oil, gasoline and butane lines.**

DUE to the war-production program, all engaged in pipe-line transportation realize that with the priority classification we receive for our various classes of equipment requests, we will have to design, revamp and get along with the equipment we have on hand. This means installing engines, pumps, control systems, etc., to do the work the best possible way with our present equipment. While this can be done, it requires much thought, innumerable headaches, excessive costs, and endless amount of juggling of units to replace old units to be used on new projects and operating requirements. This article will be confined to daily details we in the pipe-line industry encounter in our transportation operations. While many of the observations and suggestions are not new, they are significant because of their application on various major systems. These may help those contemplating changes who have not had occasion to use some of the ideas.

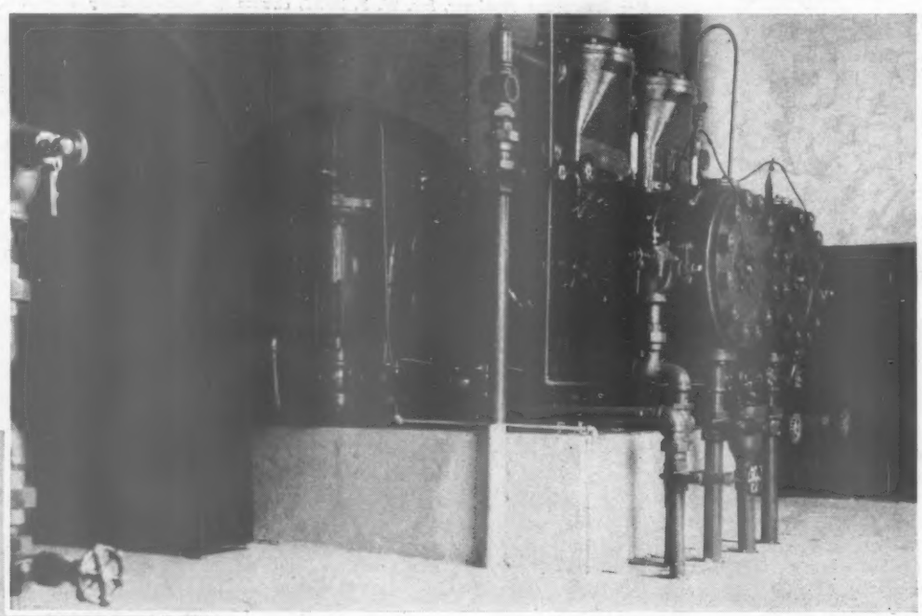
With available data on operating performance of many installations, it is a comparatively simple matter to design an automatically controlled centrifugal pump station, whether motor or engine driven. This class of equipment of course is ideal but cannot be obtained at the present time unless for a government-sponsored project, so most of these remarks will be on piston pattern and plunger-type reciprocating pumps which can be revamped for butane and gasoline service for pipe-line use.

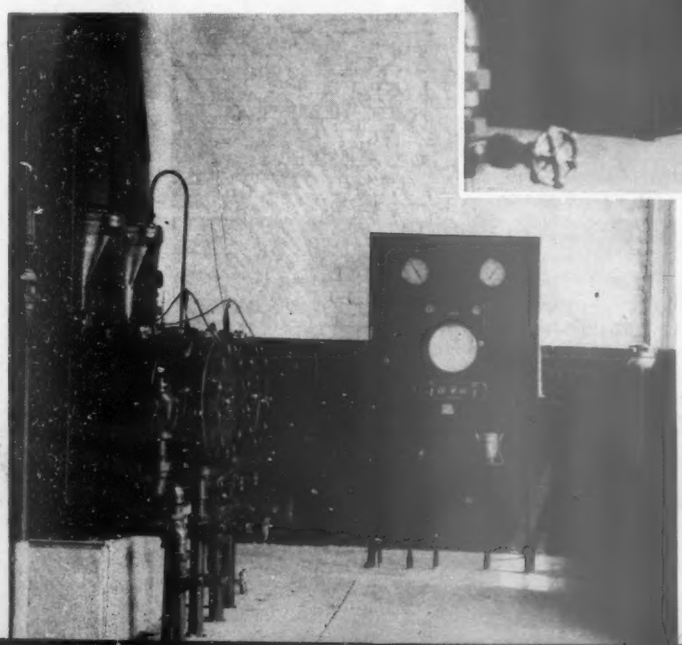
### Positive Displacement Reciprocating Pumps

Positive displacement reciprocating pumps can operate automatically very successfully without tankage from station to station by either suction or discharge pressure control. They can operate successfully with a minimum amount of labor attendance. All pressure-control apparatus at the present time is thoroughly reliable and its performance absolutely positive when properly designed and installed.

Due to the present conditions this apparatus is practically unobtainable but can be replaced by other apparatus or by devices which can be made up in our own shops. All companies have on their systems old gas or pressure regulators, diaphragm-operated valves, etc., and all sorts of uses can be made of these to actuate and perform the work which is required for pressure or automatic control.

Compressed air or natural-gas pressure is nearly always available so the pressure-transfer medium is always obtainable. With two diaphragm-pressure heads joined together with a common stem and a fulcrum attached to the center of the stem, complete lever movement can be obtained for speed requirements in operating "portable" gas or gasoline-engine-driven pump units as well as so called "heavy duty" slower-speed units. The incoming suction line pressure to pump operates one of the above diaphragm heads and station-regulated air or gas pressure operates the other diaphragm head. These heads are so regulated by stem and fulcrum travel to obtain the necessary engine and pump revolutions per minute for the line condition.





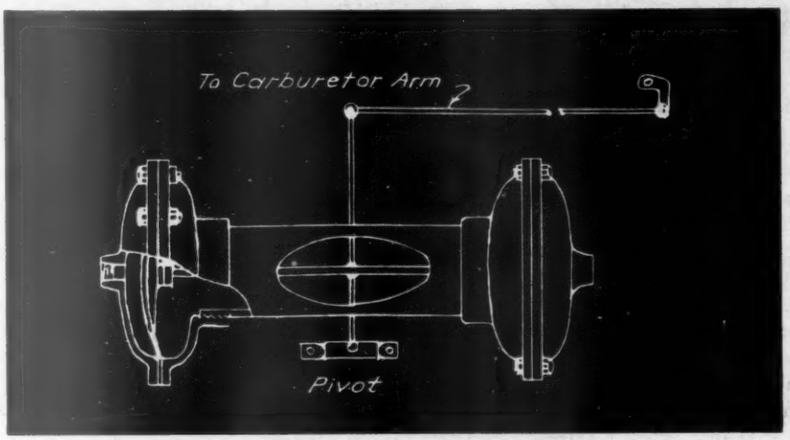
*(Above) Two-cycle horizontal gas engine equipped with a diaphragm-operated pressure-control valve between the governor throttling-type valve and cylinder inlet*

*(Left) Operating panel designed so that it is suitable for actuating pressure-control-type valve*

The control shown in the illustrations is inexpensive and is positively reliable due to the fact that its diaphragm head is leakproof. On old two-cycle horizontal gas engines which have only a governor-throttling-type valve for speed regulation and where the air and gas mixture is regulated or adjusted by hand, this device works perfectly by means of the necessary pressure control. It may be applied in the following man-

ner: On the gas line a diaphragm operated pressure-control-type valve may be installed between the above-mentioned governor throttling valve and the cylinder inlet. This diaphragm pressure-control valve is actuated or controlled by a properly designed operating panel from line-pressure requirements. The line-pressure requirements operate this valve which in turn slows or speeds up the engine and pump. The governor gas throttling valve is adjusted for open position and is operated only by the governor for an overspeed control for engine safety.

On four-cycle natural-gas engines a simple diaphragm head with a compensating spring can be installed in the mixing valve stem to open or close the mixing valve for speed regulation. This is done by means of lengthening or shortening the rod and allows the governor to function as designed. The above diaphragm head is operated by air or gas pressure predetermined from other regulators which in turn are controlled by the line-pressure requirements. There are many




*For speed regulation of a four-cycle natural-gas engine, a simple diaphragm head with a compensating spring opens and closes mixing valve*

installations on various pipe-line systems in crude-oil service where oil engines have been operated successfully for the past 7 or 8 years with suction or discharge-pressure-control systems.

While the above suggestions cover only briefly the operation of positive displacement pumps on pressure control to illustrate what can be done, it can be definitely stated that this system is successful and that no large tanks or storage facilities are required outside of the necessary small sump tanks. When clutches are not available as on large units, these units can be kept operating by pressure-operated bypass valves when the suction pressure falls too low and the engine can be kept running. With the choice of so many devices available for overspeed, high temperature, low and high pressures, etc., there is no danger of serious interruptions to pipe-line displacements or transportation if they are installed properly.

### Piston-Pattern Type Reciprocating Pumps

As the result of operating experience, certain observations may be made in regard to piston-pattern type reciprocating pumps used in butane and gasoline service where they are operated by pressure control for station-to-station pumpings.

Strainers or settling tanks positively must be provided on suction line to pump, for successful so-called continuous operation. Safety valves must be provided on suction line to protect suction designed strength of pump. Suction flanges, suction-valve decks, etc., must be designed for more than one-half maximum line pressure, in case of station shutdowns. Good continuous service and decent volumetric efficiencies cannot be obtained with speeds over 80 per cent of those used with same pumps on crude service. Liberal suction pressure over the vapor pressure of product should be provided to pump, for efficient continuous operation.

Suction valves and springs should be light and preferably of bakelite or a similar product and of disk design. Liners should be cast iron and with approximately 350 Brinell hardness. Observation of performance shows that a higher or lower Brinell has not given good service. Piston-rod stuffing boxes should be deep to accommodate a lantern ring for forced-feed mechanical lubrication. Piston rods should be lubricated with castor oil or suitable substitute. Discharge valves should be of a slow cut-off type to minimize valve hammering. Valve areas should be large and entrances to valves direct and streamlined. Observations and performances show that the old valve-over-valve type liquid end out-performs the newer side-pot type of pump when the latter has poorly designed approaches to valves. Bakelite or whalebone piston rings can be and have been designed and applied to give good performance.

With this type of pump and with any type of piston ring, cups, etc., very poor service and low-volumetric efficiencies start with discharge pressures over 750-800 lb. per sq. in. All enclosed power ends as designed by the leading pump manufacturers have given good operating performance to date. While the above type of pump is portable, simple to install, and very safe from the fire-hazard point of view, it does not give the fine operating performances on high pressures that the plunger-type reciprocating pumps give.

So-called portable pipe lines and their necessary equipment will be used for "military and emergency" purposes and the writer believes their operation will be entirely successful; but from observations, the portable engine-driven pumps should be small, as light in weight as possible, and operated in pairs for the desired capacity requirements. With two units performing the same work as one larger unit, transportation service can be maintained better in case of engine or pump breakdowns. These portable units should be installed with an open-type building or covering if one is desired, or not covered at all to eliminate any fire or explosion hazards.

When units of such a type are installed in a building without a fire wall, the ignition system should be explosionproof and the exhaust pipe should be insulated and surrounded by a ventilated duct to the ouside of building.

In regard to the operation of plunger-type reciprocating pumps in butane and gasoline service which are operated by pressure control, the following observations may be made.

Our present old plunger pumps can be revamped successfully for the transportation of the lighter products. Care should be taken to select a type or design to suit operating conditions. The pumps should preferably be of the horizontal duplex or triplex double-acting type. As most of these pumps have manifolds designed for very low pressure, care should be taken to select the strongest designed type. If none are available, then the suction side of the pump should be protected by properly installed suction relief valves. Most pumps of this type have heavy valves and springs and these should be redesigned to use lighter valves while at the same time the valve area is kept as large as possible.

### Design of Valves

Valves of design similar to those suggested for the piston-pattern type pumps can be used. Plungers should be ground perfectly smooth and plungers of 350 Brinell should be used if possible. Nearly all stuffing boxes should be rebored and deepened to allow for a lantern ring, so that mechanical lubrication can be used on plungers. The liquid ends of pump should be drilled to provide for the mechanical lubrication to the lantern ring. Mechanical lubricators can be driven from the crossheads by suitable mechanism. A lip-type packing for gasoline or butane service gives the best results to date with mechanical lubrication. A wiper gland plus the packing gland should be revamped so as to fit close to the face of the pump at the stud location. The gland should not enter the stuffing box more than ¾ in. Four to five inches of packing has been found to be very effective on all sizes of plungers. Very careful crosshead and plunger alignment should be made to eliminate packing and plunger troubles and to stop leakage and prevent fire hazards. Plunger pumps should be installed in rooms which are separate from the engines and the fire walls should be made positively gasproof. Extra ventilation should be used in buildings formerly designed for crude service. Enclosed gear cases should be ventilated. Sump pits or underground tanks should be located as near as possible to eliminate long lines which may become fire hazards due to gas formations in same. Small ventilated recepticles located near the glands can be used very successfully. By doing so the plunger and packing performance of the pump is better maintained because any leakage is attended to at once. Automatic or pressure-regulated bypass valves should be installed for main-line suction-pressure regulation. All old acetylene-welded fittings should be replaced by electric welds or welding fittings. Threaded connections should all be eliminated if possible.

The above suggestions cover many of the most important changes required in revamping this type of pump for butane and gasoline service, and no thought is given in this article to the relative merits of these pumps as compared with modern centrifugal or variable-stroke plunger pumps.

### Station-to-Station Operation

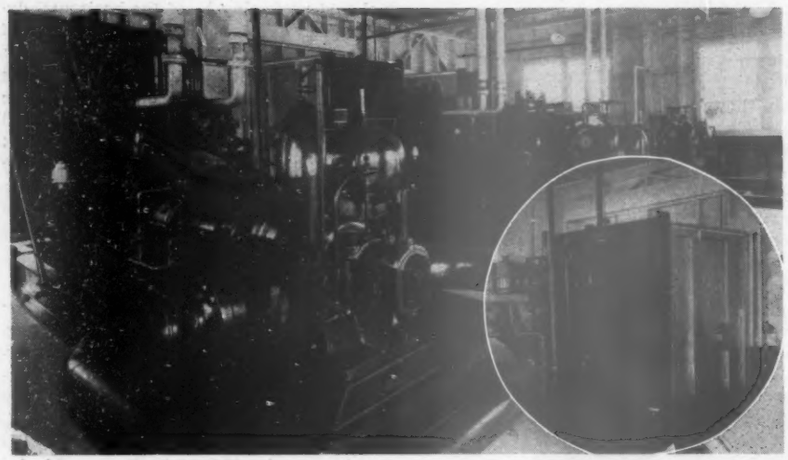
With pressure-control operation of reciprocating pumps, the initial station of course is operated by discharge-line pressure regulation to meet the transportation demands and supply the necessary predetermined suction pressure for the station ahead. Unless the initial station storage has sufficient elevation it is necessary to install a low-head pump of suitable design so that station pumps will fill properly for smooth operation. The No. 2 station ahead of course operates on suction-pressure control and keeps step with No. 1 station by maintaining a set suction pressure. It

*(Continued on Page 170)*

# Practical Suggestions

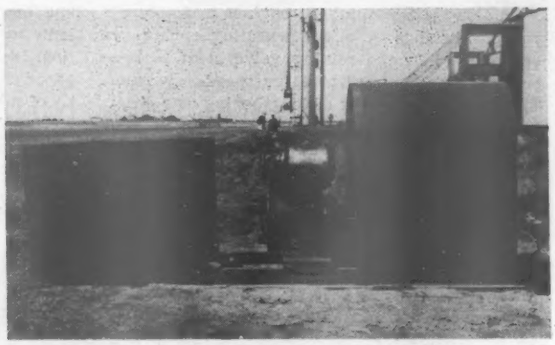
## Practices Devised to Improve Operation and Maintenance

EDITED BY PAUL REED



### Improved Fan Installation For Cooling Engines

Rather than have fans blow air through the engine radiators into the station, fans have been installed at a pipe-line station in Oklahoma so that they will pull air through the radiators and blow it out of the building. By doing this it is possible to maintain a lower temperature in the building since the heat from engines is carried outward instead of inward. With the present arrangement it is possible to have the advantage of a cooler draft passing over the gear housings. Engines have special oversized radiators. Air is moved by pusher-type fans, blowing it directly outward through an enclosed space between the fan and the outer wall of the station building. Doors to the enclosure are kept shut while the engines are operating. Station equipment includes four engines of 232 hp. each, when operating normally at 900 r.p.m.



### Housing For Gathering Pump

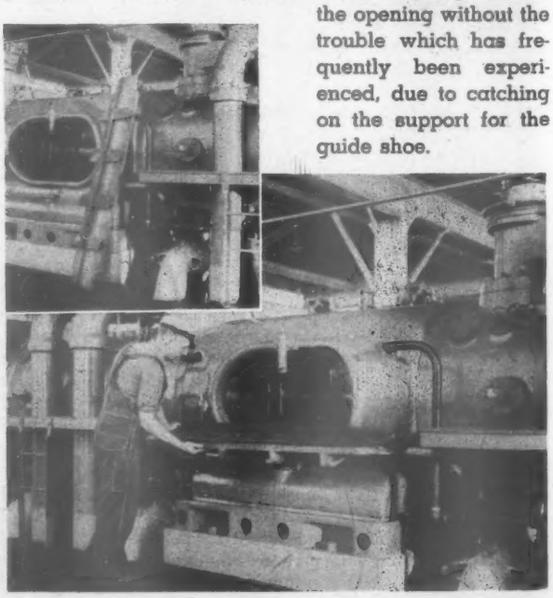
An unusual method of housing is employed by a pipe-line company in western Kansas. In the illustration, housing for pumping equipment at an installation may be observed. The housing for each pump is separate and is hinged to the base. When closed, the two housings fit snugly together, protecting equipment from dust and sand storms. At the right, the housing will be observed in a position for protecting equipment; at the left, the housing is seen lying on the ground so that equipment is open and accessible during operation.

### Hookup For Adjusting Angle of Baffle

A number of baffle devices have been used on ditching machines for the purpose of deflecting excavated material. A contractor has devised means for adjusting by a hookup which includes a cable running through a pulley on a boom, to a linkage. The angle of the baffle can be adjusted so that it will deflect dirt in the way he desires. The cable is manipulated by the operator of the ditcher. The improved control enables the contractor to get the advantages of piling up the backfill in a narrower space.

### Device Aids Removal of Piston

To get away from the labor involved in wedging the piston when it is to be removed through the guide opening for overhauling, a device has proved to be satisfactory which consists of a trough, mounted on a wooden board. This was found to save an hour's work in removal. The trough is inserted so that it is almost level with the bottom of the cylinder. The trough thus provides means for the piston to slide directly back to the opening without the trouble which has frequently been experienced, due to catching on the support for the guide shoe.

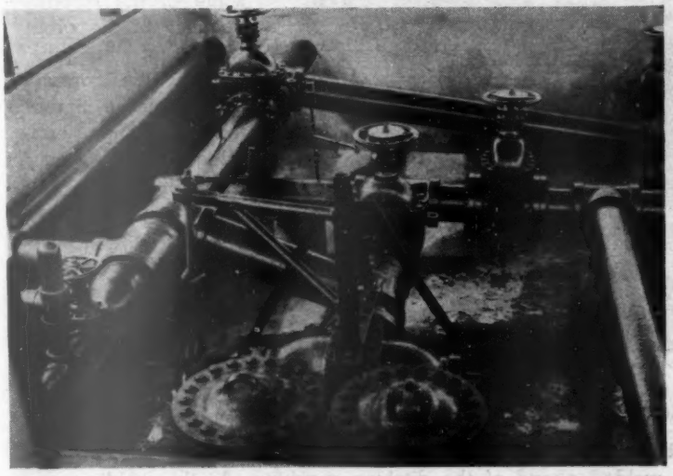


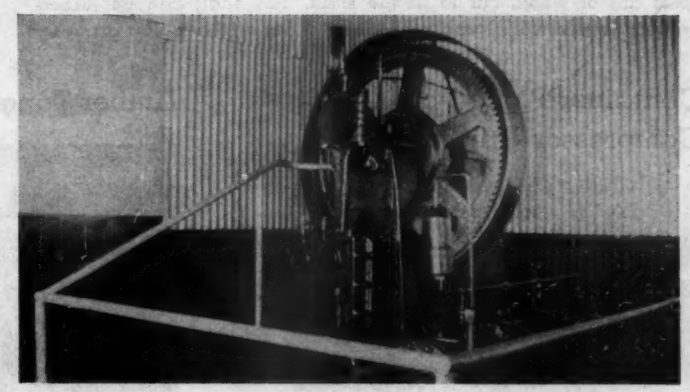
## Plows For Pipe-Line work

In the digging up of pipe lines, which is carried on extensively this year to supply material for the construction of new lines needed for war emergency conditions, plows as well as ditchers are being used. These are of two types. One pipe-line company has been experimenting with the use of a plow which is pushed ahead of the tractor. Another type of plow has been made which is towed by a tractor. The big problem in designing plows for pipe-line service is to have them made so they will not make excessive demands on tractor equipment which is doing the towing. The plow shown on the left is being used now for uncovering pipe from a crude-oil line which is being shipped to Arkansas as fast as it is being taken up, where it is re-laid for a products line.

## Davit For Removing Strainer Covers

Several pieces of equipment have been made by pipe-line companies for lifting heavy strainer covers. Unless strainers can be cleaned easily they are apt to be neglected. Lifting is done in most cases by a special lever device or a turnscrew device. A major company, using a davit equipped with turnscrew device, has made an improvement by having the davit fastened to a sleeve slipped over one of the legs of an A-frame. As a result, instead of swinging horizontally, it swings at an angle.



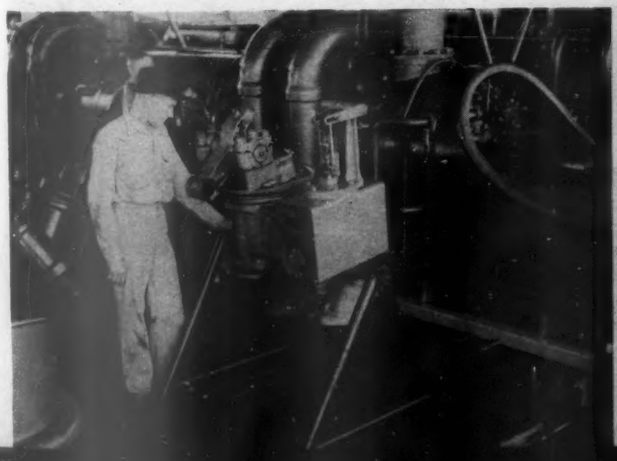


## Automatic Relief Valve On Suction Line

For automatically eliminating air at a vertical triplex double-acting suction pump which receives crude oil from gathering systems, a device is used which has proved to be satisfactory. Extending from the top of the float is a rod at the end of which is a ball. This is held snugly in a valve seat at the top float chamber by the floating action of the float under normal conditions. Fluid usually enters through a connection at the bottom of the float chamber. When air rises through this connection, the float drops, thus opening the valve at the top and venting the air to a drain pipe. After venting is completed, the float rises, closing the valve at the outlet on top of the float chamber.

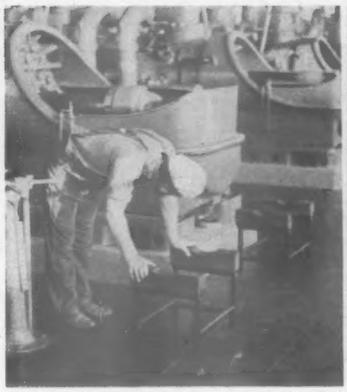
## Stand For Holding Inlet Valve

The grinding of inlet valves has been made easier by the use of a special stand in which inlet-valve assembly can be placed. The frame, coming in contact with the lower part of the inlet valve, has been made with round and square openings which exactly fit the round and square parts of the inlet-valve assembly. This framework is pivoted on the stand so that it can be turned easily while valve grinding is being done. After grinding inlet-valve stem in the seat, the assembly can be turned over so as to clean mixing-valve chamber and valve seats. Before using this device, it was customary to block up with skids, and, when the assembly was turned over, it was necessary to block it up again. It has been estimated that this saves 4 to 5 hours' time. The assembly is held in place on the frame by two 1 by 6-in. bolts. While work is being done, the frame is held in a rigid position by ¼ by 6-in. chain.



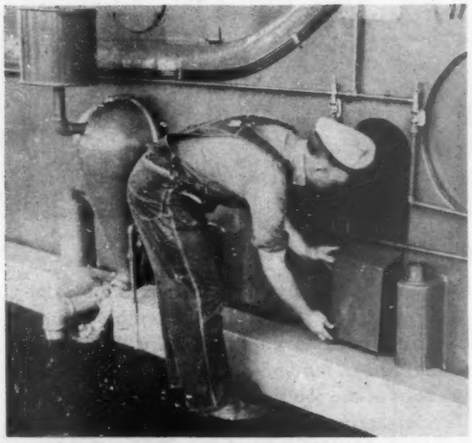
# Practical Suggestions

## Horses For Supporting Compressor Pistons



To get away from the disadvantages of supporting compressor pistons on wooden skids, which have been found to be awkward to handle, some companies have made horses for this purpose. These horses are made as a single unit or as two units, depending upon the preference of the engineer. The use of horses makes it possible to support the piston high enough so that the rings do not touch the floor. The framework of the horses is fabricated by welding. The top pieces, on which the piston shaft rests are of wood, cut to fit the shaft. The shaft can be turned without injury while carbon is cleaned out of the piston grooves. With these horses, it is easier to check the rings and to fit power packing. Overhauling work can be done more effectively.

## Container Placed on Compressor Unit



A sheet-tin box with an opening and fasteners has been used on compressors for catching water and lubricating oil which drains from service rod. Before these boxes were used, water and oil ran to water outlet under the cylinders. In draining to the hot well, it sometimes became emulsified, and would give trouble when the emulsion returned to cooling system.

## Timber Tongs For Handling Heavy Skids on "Big Inch" Line

In the construction of the 24-in. crude-oil pipe line from Texas to Illinois railroad ties are used for skids by some of the spreads because of the great weight of the pipe. One of the contractors furnishes timber tongs to men handling these heavy skids in order that they may do their work faster and more safely. With these tongs two men can easily handle the skids.

## Pipe-Line Method In the Plains Country

In West Texas lines have been laid by a practice which is unusual in other parts of the country. Pipe is welded ahead of the ditching machine. As the welding proceeds, pipe is supported on wooden blocks. Pipe is moved by a well-known device, called the "grasshopper"; during lining up. To clear the inside of the pipe, an iron cannon ball is rolled through it. In the picture, a rabbit can be seen emerging from the pipe just ahead of the cannon ball. The welding crew consists of one welder, two helpers, and a truck driver.

# Results of Corrosion Inhibitor Demonstrated in Products Line

By S. S. SMITH
Manager, Products Pipe Line, Shell Oil Co., Inc.

DURING the latter part of 1937 and the early part of 1938, Shell Oil Co., Inc., constructed the first section of its products line to be built from Wood River, Ill., to Columbus, Ohio. This first section ended at Zionsville, Ind., and comprised 215 miles of 8-in. pipe. The line was first tested by compressed air and was thoroughly blown to remove dirt and the rubbish of construction.

In March 1938 the line was pumped about half full of water, taking squeezes at regular intervals for hydraulic testing. When the first half of the line was tested, gasoline was pumped behind the water and the testing of the line completed using the gasoline in the initial portion of the line and water in the downstream end at Zionsville. During the next 4 months, the line was completed into Lima and Springfield, Ohio, and gasoline was used for testing the Zionsville-Lima and the Lima-Springfield sections.

From the standpoint of internal corrosion in the line, the use of water for testing was probably a mistake because it required the better part of 2 months to eliminate all of this water. During the remainder of 1938, gasoline only was pumped through the line and there was no very serious corrosion as indicated by the pumping pressures required. During this period, of course, the mill scale was probably corroding off and as is usual with products lines, there was no serious loss of throughput capacity.

During this period of operation, the line was scraped at regular intervals of 2 weeks using three scrapers in each run. Each scraper was composed of the conventional shaft and four synthetic-rubber disks. During this period no figures were accumulated on actual receipts of scale but it is noted in the early operating reports of the line that "we began to note large quantities of pipeline scale at the time of scraper runs."

## Corrosion Factors Studied

Recognizing the importance of this problem of internal pipe-line corrosion, Shell Development Co. had begun an investigation, which, in its initial stages, had to be undertaken in the laboratory. Since these studies and their results will be thoroughly covered in other papers by Dr. A. Wachter, who was in charge of the investigation, it is not necessary to report them here. It is sufficient for the purpose of this paper to state that Dr. Wachter's studies revealed the nature and importance of the corrosion factors involved, developed new experimental techniques, and resulted in the discovery of a corrosion inhibitor* which has been applied with success to all of the products pipe lines operated by the Shell Oil Co., Inc.

It is the purpose of this paper to describe the field usage of the inhibitor in one of the pipe lines to which it has been applied and to attempt to evaluate this inhibitor for use in other product lines.

As a matter of descriptive interest, the inhibitor is a chemical highly soluble in water, which is continuously gravity-injected into the stream of gasoline or products at this stream passes the initial station of the pipe line. Its effect is to inhibit the water contained in the gasoline or contained in solution and later dropped as free water due to reduction of temperature in the line. Concentrations of inhibitor in excess of 0.03 per cent are required in the free water present to preclude corrosion and, additionally, the water must be maintained alkaline. When in actual operation the effluent water is maintained

*Predominantly sodium nirate. Wachter patent.

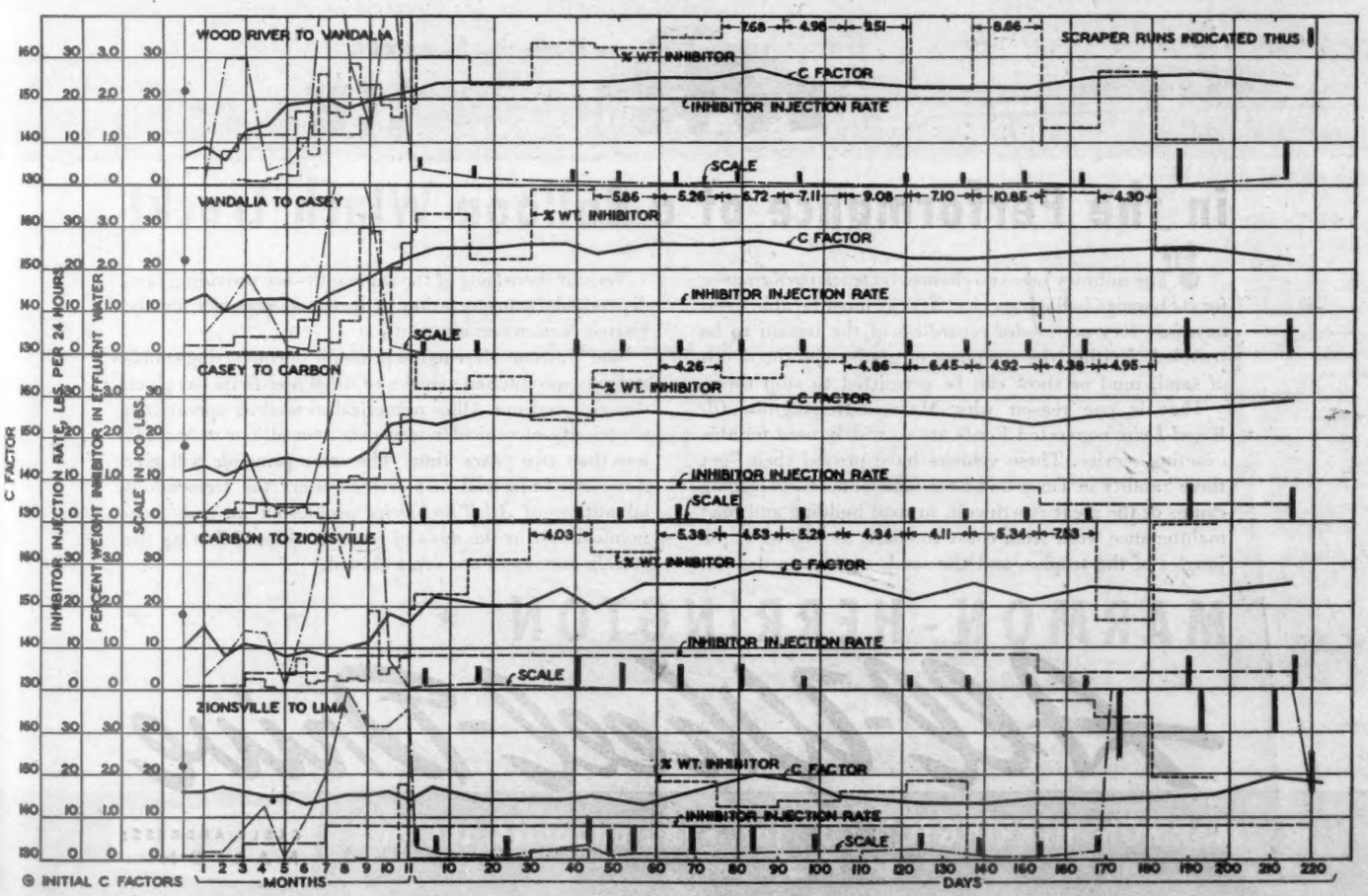
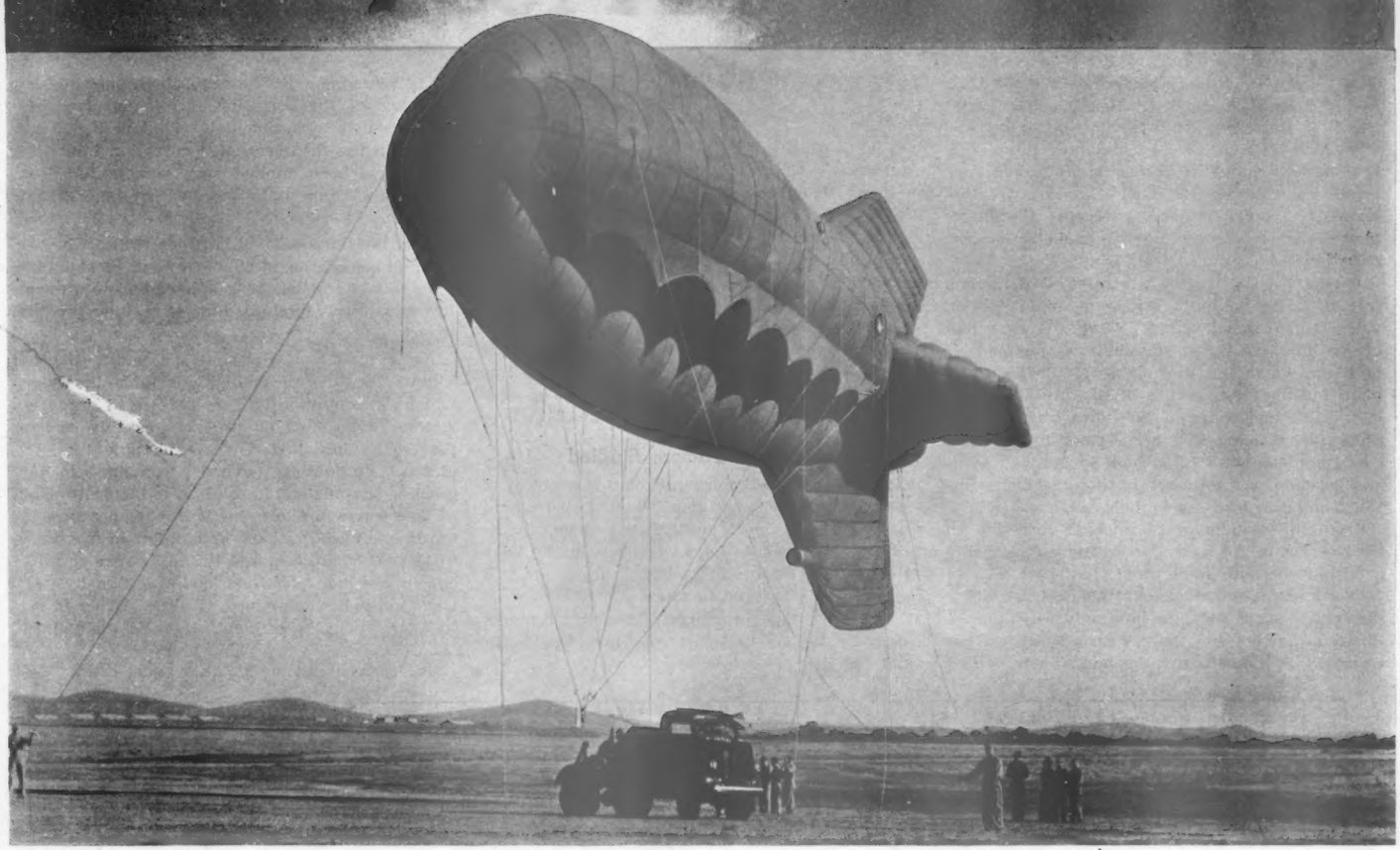



*Chart 1—Effect of inhibitor on "C" factor and scale removal in Wood River-Lima products pipe line*

"Maybe" won't do...



## in the Performance of a Balloon Winch Truck!

● The military takes no chances on truck performance for its barrage balloon service. Trucks must be able to go *anywhere they are needed* regardless of the terrain to be traveled. Neither the steepness of grades nor the depth of sand, mud or snow can be permitted to stop them.

That is one reason why Marmon-Herrington *All-Wheel-Drive* converted Fords are so widely used for this exacting service. These vehicles have proved their "get there" ability in Texas and Louisiana oil fields, in logging camps of the great Northwest, in road building and road maintenance work from coast to coast, as well as in the jungles of the tropics, and the sands of African deserts.

Tens of thousands of the same units are providing fast, dependable transportation of men and materiel for the United Nations on all fronts.

The Marmon-Herrington principle of converting standard mass-production vehicles to *All-Wheel-Drive* has given America and our Allies numerical as well as operational superiority of vehicular transport over all our enemies in less than two years' time. The same principle will give American industrial and civilian users the tremendous advantage of *All-Wheel-Drive* propulsion at truly economical cost in the days of reconstruction following the certain victory of our arms abroad.

MARMON-HERRINGTON ★ ★ ★

All-Wheel-Drive

MARMON-HERRINGTON CO., Inc. • Indianapolis, Indiana

CABLE ADDRESS: MARTON

above the stated concentration and with pH value in excess of 7.5, laboratory tests indicate that no corrosion ensues.

As a matter of actual operating practice, Fig. 1 shows a typical injector setup in which a solution of inhibitor, caustic and water is made up in 5-gal. batches to serve a 24 hour injection period.

Referring to Chart 1, it will be noted that during early operation "C" factors had dropped rather sharply on the first four sections of the line. The Zionsville-Lima section fell off to some degree but not so seriously as did the other sections. This is interpreted to indicate that most of the water dropped out in the two sections between Casey, Ill., and Zionsville, Ind. This is perhaps explained in part by the topography of the line, which, as indicated in Chart 2, is reasonably level from Wood River to Casey, but climbs several hundred feet between Casey and Zionsville. The temperature gradient on the line reflects to some extent the same condition, as also is shown by Chart 2.

The injection of inhibitor was initiated at Wood River, at Vandalia and at Casey, Ill. Parenthetically, it should be noted that each of the stations on this line is equipped with strainer and water-settling tanks so that for purposes of control of inhibitor it is assumed that all inhibitor is lost at each station and must be reinjected. This is caused by the fact that the inhibitor is not soluble in gasoline but only in water, and, therefore, is dropped out in the strainer facilities at each station. Considerable care is exercised to maintain the line as water-free as possible, although, in the nature of things, operating oftentimes on streams that are settled less than 24 hours after leaving processing units in the refinery, it is not always possible to maintain dry product coming

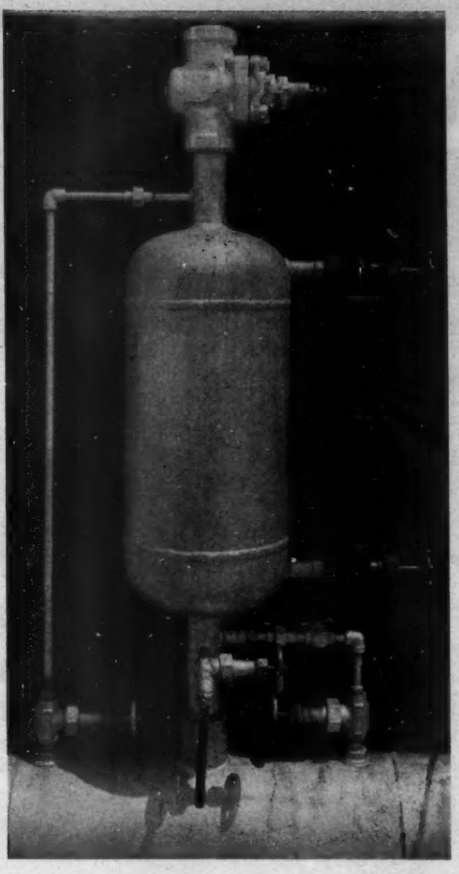


*Fig. 1—Special equipment for injecting inhibitor into line*

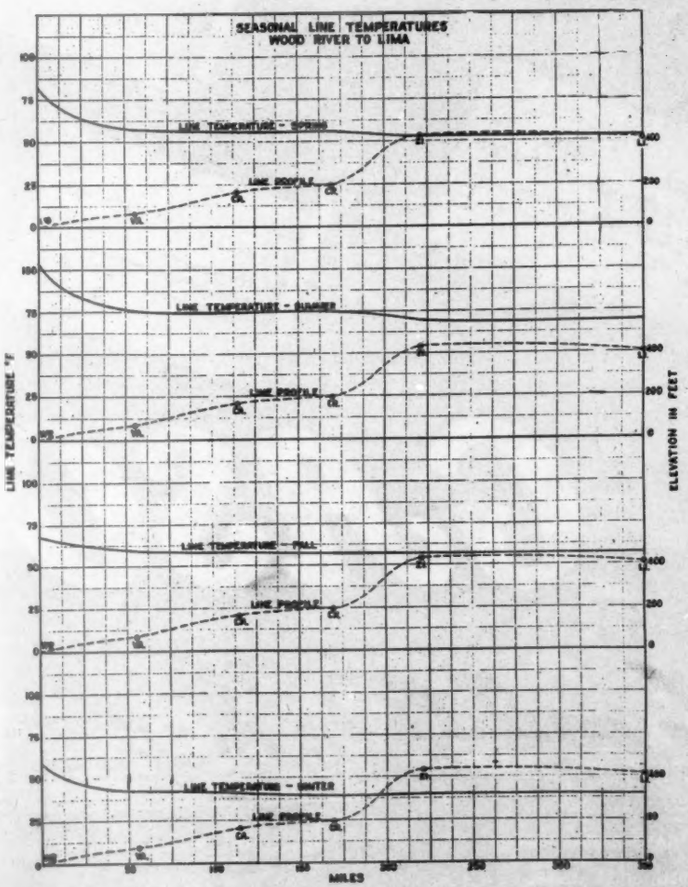



*Chart 2—Topography of the line is reasonably level from Wood River to Casey. Temperature gradient reflects to some extent the same condition*

into the line. It is also frequently true that material pumped in the line is as much as 30° or 40° above line equilibrium temperature. This effect can be noted on Chart 2.

During the early use of the inhibitor it was used in this line in small daily quantities at first and later in rather large daily quantities in order to obtain information regarding the rate at which improvements are effected as a function of injected quantities. There was no very noticeable effect upon scale removal during this period although "C" factors manifested some improvement.

Later the injection rate was stepped up quite rapidly and immediate effect ensued in improvement of "C" factor and in actual movement of scale. Chart 1 begins shortly before this rise in the rate of injection.

Chart 1 shows four curves: The solid heavy line is the "C" factor as determined by the modified Hazen & Williams formula developed by Richardson & Rea, of Great Lakes Pipe Line Co. and reported in this publication under date of January 23, 1941.

The dotted line shows per cent by weight of inhibitor in effluent water.

The dashed line shows inhibitor injection rate.

The dot-dash line shows weight of scale removed at each scraper run: the number of scrapers run is shown by the heavy blades at the base of each section's curve.

The curves, viewed in retrospect, show some over usage of inhibitor up until quite recently. However, at the time, it was not so apparent that satisfactory results were being achieved and as long as "C" factors were showing some improvement it was considered sound to over-inhibit, particularly since the cost of inhibitor is low.

It is to be noted that the section, Wood River to Vandalia, showed a minimum "C" factor of 128 before Chart 1 starts. The chart also shows a recent maximum of 156 and the fact that recent scale receipts for this section of line have been negligible.

### Major Improvements Began

Major improvements began in the second and third months coincident with sufficient inhibitor injection to attain testable amounts in the effluent water. This did not occur until the injection rate was increased to 12 lb. daily. Highest injection rate was 20 lb. daily and the present rate is again 12 lb. daily. This agrees with what should be expected with the large temperature drop shown for this section of the line (Chart 2).

The Vandalia-Casey section never had as low a "C" factor as the first section (Wood River-Vandalia). This would be expected because most of the water drops out in the first section, consequently not so much corrosion occurred previous to inhibiting. The lowest "C" factor, 133, was observed before the beginning of Chart 1. Later it improved slightly, but like the first section of the line, material improvement was evident only when the injection rates were increased. The "C" factor then came up quite rapidly to around 155, where it has remained.

The Casey-Carbon section showed even slower improvement, but when injection rates were increased, tremendous amounts of scale were removed and the "C" factor improved steadily to between 155 and 160.

The Carbon-Zionsville section lies on a heavy upgrade as previously noted. During the spring and summer months this section of the line shows a 1° to 3° temperature drop (Chart 2), and it is presumed that these two factors operate to hold a fair amount of water in suspension on some of these slopes. At any rate, a low "C" factor of 135 held approximately constant during early operation and only begun to show improvement with heavy injection of inhibitor. The present level of about 155 is apparently the line characteristic because there has been no appreciable scale removal for many months and the effluent percentage has been satisfactory throughout that time.

The Zionville-Lima section is 128 miles long and has operated at a lower throughput than have the previous four sections throughout the life of the operation. The "C" factor has never been below 145 but also has never been much above 150. Recently it has been necessary to push all possible material through this section of the line and it is noted that heavy inhibition plus heavy scraping have raised the "C" factor to 150.

There are several tentative conclusions which can be drawn from these various data:

1. All effects in a long line are much slower than usually anticipated — scale moves slowly, "C" factors change slowly, and only a long-period

*(Continued on Page 90)*

# LEAVE IT TO ENGINEERS

Fig. 2652. 12" stroke—176 bbls. at 1500 lbs. to 592 bbls. at 500 lbs.

Fig. 1741, with Diesel Drive—250 bbls. at 600 lbs. to 502 bbls. at 300 lbs.

Fig. 1742. Electric Motor Drive. 54 bbls. at 1400 lbs. to 250 bbls. at 600 lbs.

Fig. 1743. 156 bbls. at 925 lbs. to 578 bbls. at 260 lbs.

Fig. 2249. Also mounted on trailer. 46 bbls. at 750 lbs. to 126 bbls. at 300 lbs.

INDIVIDUAL VALVE CHAMBERS
for better performance

NO OVERLAPPING OF RODS
made possible by long frames. Pumped fluids will not reach crankcase

EXTRA-DEEP STUFFING BOXES
ive tightness without undue ...rsion

HIGH-TENSILE-STRENGTH MOLYBDENUM CAST IRON
provides extra strength and safety in fluid-end casting

LARGE VALVE OPENINGS
Extra-large valve openings and fluid passages permit filling at highest speeds

GASO

Fig. 201. GASO Rodline Pump. 30.96 bbls. at 18 strokes, to 41.28 bbls. at 24 strokes.

Fig. 2050-S. Portable Unit. 59 bbls. at 1000 lbs. to 255 bbls. at 250 lbs.

# TO RECOGNIZE VALUE

## *They Made* GASOS *the Worlds Leading Pipe Line Pumps*

**For over 25 years we have directed all our efforts to a single goal: the design and manufacture of better pipe line pumps. Never have we wavered from that objective, never have we faltered in our policy of continuous development and improvement. . . . Is it any wonder, under those conditions, that GASOS should have earned the position of leadership that pipeline engineers and superintendents have accorded them? It's the engineering that sells GASOS and their day-in-and-day-out performance that keeps them sold . . . Ask for catalog . . . Gaso Pump & Burner Mfg. Co., 902 E. First Street, Tulsa, Okla. Export Office: 149 Broadway, New York. Houston: 5716 Buffalo Speedway. Los Angeles: Service Oil Field Supply Co., 5333 S. Riverside Drive.**

**FLOOD LUBRICATION**
for years, crosshead and connecting-rod bearings — by oil bath in enclosed crankcase

**EXTRA-LARGE ROLLER BEARINGS**
mount crank and pinion shafts, each operating in separate removable housing sealed off from crankcase oil

**CRANKS SET AT 90-DEGREE ANGLE**
give overlapping piston stroke, assuring smooth flow

**HERRINGBONE GEARS**
are center-mounted on shafts to equalize loads on bearings

# PUMPS

Fig. 1550. 59 bbls. at 1000 lbs. to 255 bbls. at 300 lbs.

Fig. 1849. 46 bbls. at 900 lbs. to 126 bbls. at 350 lbs.

Fig. 301. Piston Power Pump. 24 to 30-inch stroke. 31.73 to 157.36 bbls. per hour.

## Dew-Point Recorder Utilizing Photoelectric Relay Safeguards Natural-Gas Line Against Freezing

By J. A. SETTER
Industrial Department, General Electric Co., Denver, Colo.

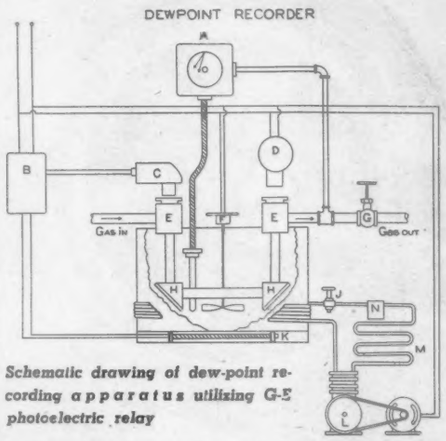
To prevent condensation of moisture and possible freezing of its gas lines during the winter months, Colorado Interstate Gas Co., which furnishes Denver with natural gas from Texas fields, has built a novel dew-point recorder utilizing a General Electric photoelectric relay. With the recorder, continuous readings of temperature at which condensation occurs are made where the gas enters the Denver metering plant. If calculations based on the readings show the dew point to be too high, instructions are dispatched to dehydrating plants to remove more moisture before trouble occurs.

The equipment consists of a small tank filled with antifreeze solution into which is immersed a U-shaped highly polished gold-plated tube. Through this tube passes a continuous flow of natural gas from a bypass valve in the main pipe line. Both ends of the tube are provided with plate-glass windows. Above the windows, a General Electric light source and photoelectric relay are mounted so that the light shines through the tube and is reflected to the phototube.

For controlling the temperature of the antifreeze solution, the tank is cooled with coils of a small domestic refrigerator and heated with suitable strip heaters. As the cooling system reduces the temperature of the solution, the gas is chilled until a film of condensate is deposited on the inside of the highly polished tube, thus reducing the reflection of light to the phototube.

Bein sensitive to a change of ½ ft.-candle, the phototube operates to disconnect the cooling coils and connect the heaters to warm the solution. When the solution is warm enough, the condensate disappears and the process is repeated. A small motor-driven stirring paddle in the antifreeze solution equalizes the temperature of the bath.

A recording-bulb-type thermometer immersed in the solution records the temperature of the solution. On the same chart the natural-gas pressure is also recorded. From these two records, the dew point is calculated.

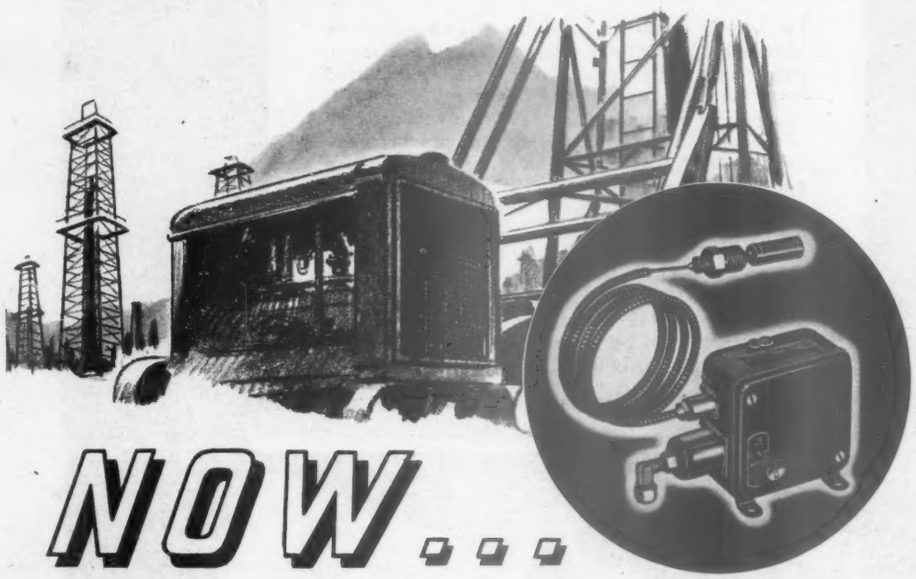



*Schematic drawing of dew-point recording apparatus utilizing G-5 photoelectric relay*

A—Recording temperature and pressure gage. B—Photoelectric relay. C—Photoelectric tube. D—60-watt 110-volt clear bulb. E—Light receptacles. F—Telechron 60-r.p.m. motor and agitator. G—Throttle valve. H—Light-reflecting boxes. J—Refrigerating expansion valve. K—1,500-watt nichrome heating unit. L—¼-hp. methyl chloride refrigerating unit. M—Cooling coils. N—Condensing tank.

The temperature-chart curve looks like a sine wave, with the tops and bottoms of the loops about 2° to 3° apart, and with a frequency of about 10 to 15 minutes depending on the rate of flow of gas, change of pressure, and other variables.

The apparatus was conceived and constructed by W. R. Beardsley and L. F. Carter, of Colorado Interstate Gas Co.



NOW...

ENGINES SHOULD BE PROTECTED

Because so much is at stake, it is more important than ever before to maintain uninterrupted engine operation. Today, breakdowns with their attendant delays are costly... costly, not only in money but in LOST TIME which never can be regained.

You can avoid interruptions in production and help conserve critical materials by protecting your engines with Penn automatic safety controls. Engine Safety Controls... as developed and perfected by Penn engineers... are easily applied to any internal combustion engine—Diesel, gas or gasoline. These controls will sound a warning alarm... or, if desired, stop the engine operation... if the cooling water system fails, if the bearings become over-heated, if the oil line is clogged or broken, or if oil pressure drops dangerously low from any cause.

Besides preventing damage these automatic watchmen conserve the engine operator's time... release "man-hours" for other necessary tasks. Investigate these Penn Engine Safety Controls... you'll be amazed at their low cost! Write now for your free copy of Bulletin E-100 which contains complete information. *Penn Electric Switch Co., Goshen, Indiana.*

PENN CONTROLS

REFRIGERATION AIR CONDITIONING ENGINE HEATING PUMPING AND AIR COMPRESSOR

## Results of Corrosion Inhibitor Demonstrated in Products Line

*(Continued from Page 87)*

collection of "C" factors and scale receipts is useful for analysis.

2. Overinhibition is necessary to improve "C" factors and move scale.

3. Effluent inhibitor concentration is the index of effectiveness of inhibition.

4. A products line can be cleaned, and kept clean, by the use of this inhibitor with only nominal scraping to move the scale dislodged from the pipe into the stations.

5. There is some evidence that a previously rusted line attains a higher "C" factor than a line which has not corroded. This is probably due to increased average internal diameter of the line.

6. There is no danger to the line if it is moderately overinhibited to hasten scale removal. No difficulty has resulted in ordinary operation from the use of the inhibitor.

7. An old scaled line with "C" factors under 130 will probably improve for a year under inhibition and will attain approximately original "C" factors.

Note: The author is indebted to R. K. Schulze and W. J. Curry for assistance in the preparation of the material contained in this paper.

## HILL-HUBBELL *Steel Pipe Protection is a NATURAL for UNCLE SAM . .*

**Pipe lines are the arteries of our national war effort. Gas, oil and gasoline must flow uninterruptedly. Costly repairs due to inadequate Steel Pipe protection work hardship on war industries and mechanized military fuel supply and operations.**

**NOW; more than ever before, you need HILL-HUBBELL factory processed Steel Pipe protection.**

**Buy STEEL PIPE MILL Coated-and-Wrapped at any of these Mills**

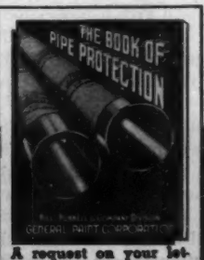
**Jones & Laughlin Steel Corporation**

**National Tube Company**

**Spang Chalfant, Inc.**

**6⅝" O.D. natural gas line in Georgia.**

**6⅝" O.D. Gasoline line in Illinois.**




**A request on your letterhead will bring a copy of the book of "PIPE PROTECTION."**

## GENERAL PAINT CORPORATION

HILL, HUBBELL & CO. • Division • Cleveland, Ohio

• EXPORT OFFICE: SAN FRANCISCO, CALIFORNIA, U. S. A. •

# Improved Practices Employed By Humble Pipe-Line System

By PAUL REED

PRACTICES connected with line maintenance and station operation which may be observed at a large main-line station of Humble Pipe Line Co., on the Gulf Coast, are evidence of continual progress for improving the efficiency of procedures by this organization. Some of these improvements are reflected in equipment which has been devised by men engaged in the company's operations. Some of it is entirely a matter of improving the routine itself, and in some cases it involves the utilization of improved equipment on the market.

An outstanding feature of the station is the good safety record maintained over a period of years. It has been frequently noted that where men are constantly developing improvements in methods for carrying on the work of operation and maintenance there is likely to be a marked decrease in the number of accidents, even though the new devices employed are not made primarily for safety purposes. In most cases new devices are developed in order to get the work done more easily or more effectively. What increases efficiency, incidentally, often increases the safety of working conditions. However, the main explanation for a good safety record is usually the close attention paid to the elimination of hazards. Since the time the station was built in 1918, it has maintained a notable record

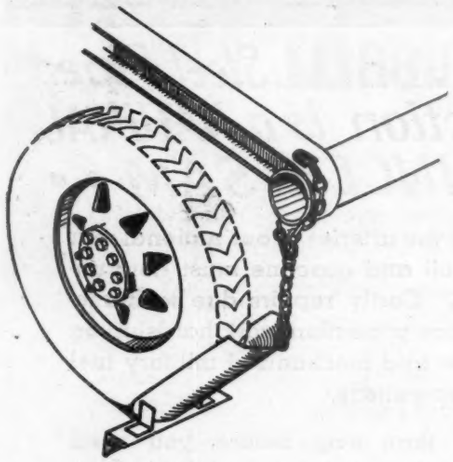


*Fig. 1*

for safety. In the office there are three cups which have been awarded for meritorious safety records; and the station is striving for a last leg which will give it possession of a fourth cup. This article describes some of the practices observed in a tour of facilities including the company's shop, yard, warehouses, pump station, and tank farm.

At different times in the past, the company has provided manifolds for stations located elsewhere on its system which have been prefabricated at the shop at this large station. This shop also makes anchor bolts for diesel-engine installations as well as special nuts put below in the concrete foundation. These are shipped to various parts of the line.

A number of provisions have been made for improving the handling of trucks and engines used for operations in the district surrounding the station. Instead of blocking behind the wheel of a truck with a wooden skid, a device has been fabricated by a welder which is light and convenient. This is shown in the accompanying illustration. (Fig. 1.)

In order to reduce the number of broken arms which sometimes occur from cranking small pumping engines used in gathering systems, an antikick device has been designed by the company's master mechanic. This is bolted on the front of the engine when it is to be used. The principal feature of this device is a shoe which acts as a drag. A trigger is released by a mechanism operating on the inertia principle. This is something of an innovation, which the company has been experimenting with. Tests have been made by putting a tractor on the power end of a pumping engine and letting the clutch in for the purpose of observing how the antikick device functions.

### Truck Seats for Workmen

In order to utilize truck and trailer equipment as extensively as possible, a special frame has been made for use in transporting men in pipeline gangs to their work. This consists of frames made by a welder which can be pulled on to the truck body by a winch. The part of this frame which forms the seats is made in the following manner: The uprights are of all-welded construction made with a sleeve-and-coil-feature to take the shocks of traveling over the road. Boards can be slipped through the supporting frames of these uprights. When not in use, these welded frames are left in the open, but the boards are removed so they may be protected from weathering. (Fig. 2.)

Since most corrosion comes in the bottom of pipe, it is advisable to turn lines at certain intervals in order to extend the life of the line. For

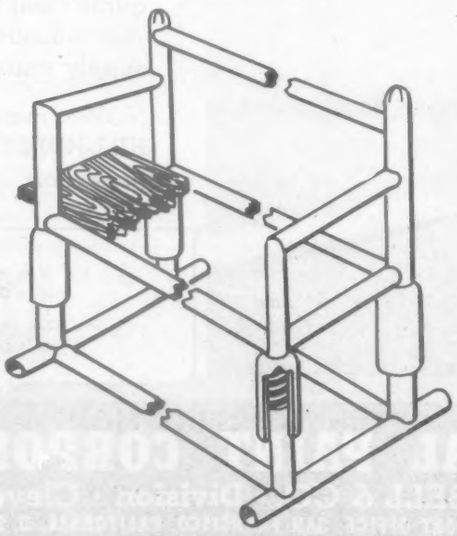


*Fig. 2*

this purpose a special pipe-turning gadget has been made to equalize the pull on the tongs used in this operation. The principle of this can be observed in Fig. 3. It can be seen that this is a

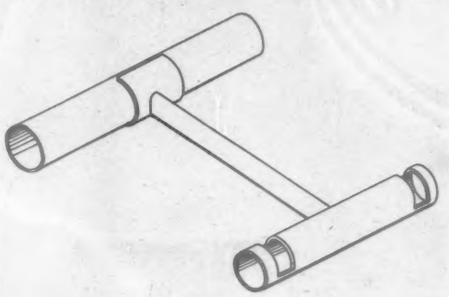


*Fig. 3*

T-shaped device which presses against the upper ends of the chain tongs, gripping the pipe, to accomplish the desired results.

A practice has been adopted for aiding the operation of pipe cutters. There has been trouble at times in using pipe cutters on large pipe when pits in the pipe interfere with making a straight

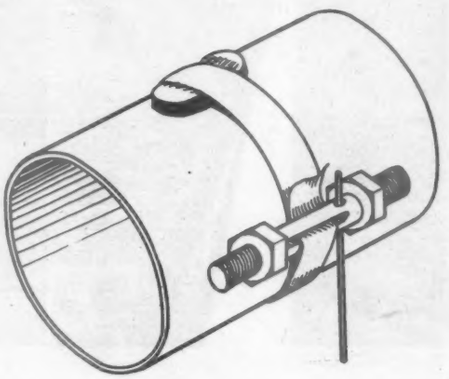
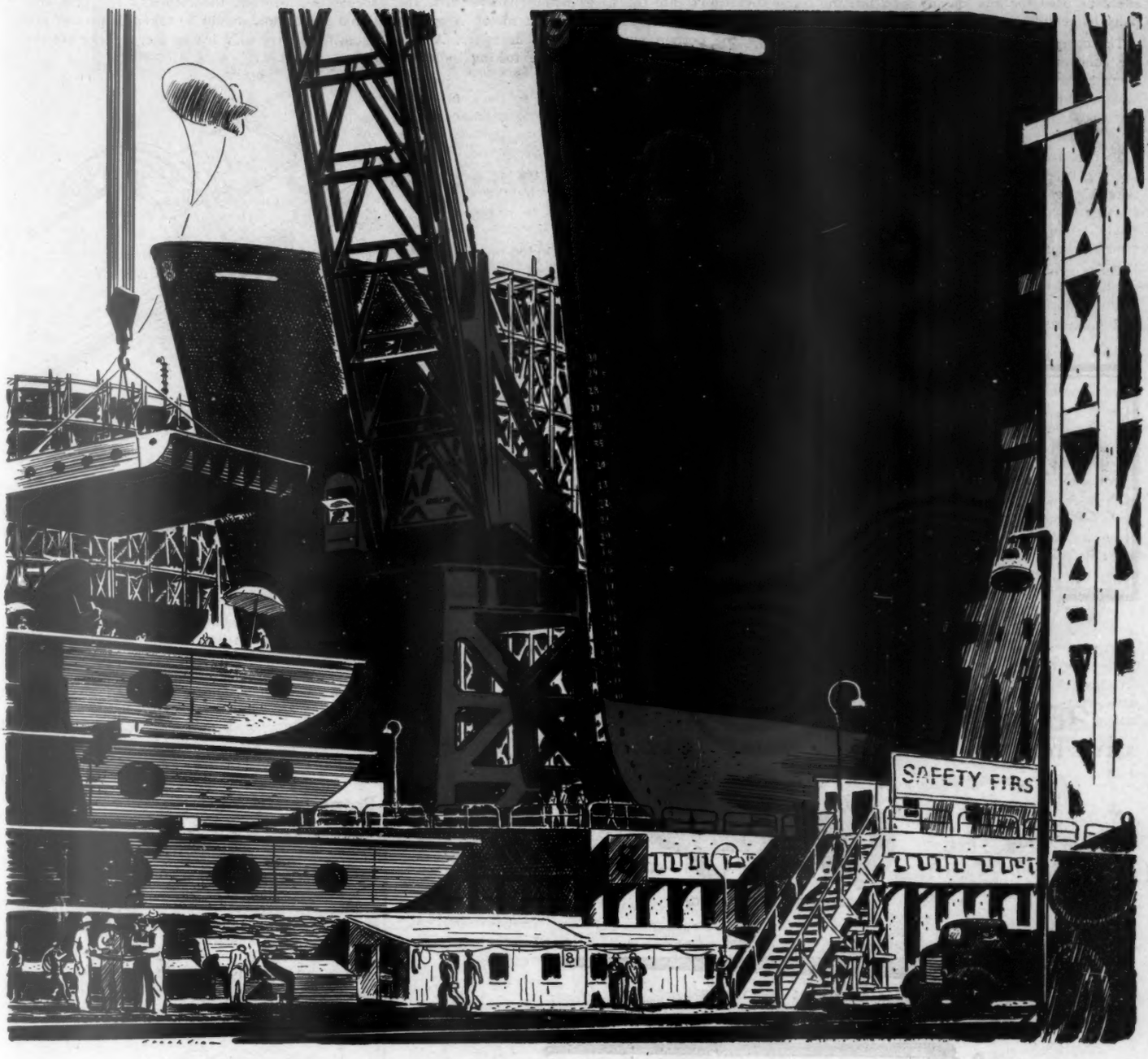


*Fig. 4*

cut. When the pipe cutters are turned on the pipe under these conditions, instead of cutting deep into the pipe the action is more like that of threading. To avoid this, two steel bands are placed around the pipe with a space left between them, in which the cutters of the pipe cutter operate. These two bands act as guides to keep the cutter on the right track. Without the use of these bands it has sometimes been found that an hour has been wasted in getting the cutters started. After the cutters start cutting deeply into the pipe, the bands serving as guides are removed.

### Remove Saddles Ahead of Welder

One of the company employes has devised a convenient method which makes it possible to remove saddles ahead of the welder, without using an hydraulic device. This consists principally of a steel band which is wrapped around the rubber cone plug used for stopping the leak. The band is held in place by a simple locking device which can be held in the desired position by the




# WORLD'S SHIPBUILDING RECORD!

**15 Liberty Ships Delivered in One Month!** That's the all-time shipbuilding record of the Terminal Island yard of the California Shipbuilding Corporation. It has never before been equalled by any shipyard, any time, any war.

On this *first* anniversary of its *first* launching Calship is 200 days and 36 ships ahead of schedule...has more than doubled its expected output.

The yard that 20 months ago was a barren mud flat is today a shipbuilding factory, converting steel into ships at a rate that Admiral Vickery has termed "an inspiration to the nation." It is consistently launching and delivering 10,800-ton cargo ships at a rate of three per week, or better.

We are proud of Calship's record, and proud that BMP engineers designed the yard and have contributed to the development and perfection of its production methods.

**bmp**

**BECHTEL-McCONE-PARSONS CORPORATION** ENGINEERS • CONSTRUCTORS

*We are staffed to perform any one or all of the following services: Engineering • Design • Procurement • Construction • Business Analysis • Management of Operation • 601 West Fifth Street, Los Angeles • 220 Montgomery Street, San Francisco*

use of a welding rod or a nail. The welder welds a patch over the rubber cone plug. This device could be used for pipe of any size, but the company has employed it mostly for 8-in. (Fig. 4.)

The company is experimenting with equipment for continuous recording of gravity. This functions by measuring the amount of suction at a siphon which is created to raise 10 in. of oil. As the gravity of the oil changes, this is indicated on a chart.

The usual method employed at present for keeping track of oil passing through a line is to take hydrometer tests at 15-minute intervals, starting 1 hour before a change in gravity of crude is expected and continuing for 2 hours after the change has occurred.

There is an individual hydrometer for each incoming and outgoing line. In addition hydrometer readings are taken at each of the trunk station pumps. In the testing room there are 12 individual gravity-testing devices known as "gang pots." In the pots, oil comes in at the bottom and overflows into the hydrometer chamber. The lid is made of nonsparking babbitt metal. A spring at the bottom cushions the hydrometer. A gas outlet vents to the top of the testing building. (Fig. 5.)

Before testing for b.s. and w. in the centrifuge, samples are cut 50 per cent with gasoline. A liquid steel trap at the bottom of the centrifuge keeps fumes from getting into the room.

The testing room has two testing centrifuges. Samples are heated to 120° by water heat. A nearby conversion table aids in converting temperature readings to 60° F.

To aid in replacing light bulbs on the ceiling of the station building, platforms have been suspended by frames below the traveling crane. Men replacing light bulbs can stand on these platforms.

The railing along the walkway around the top of diesel engines serves as a protection against accidents. However, the company felt that additional precaution should be taken to protect men when they have to work in a crouching position

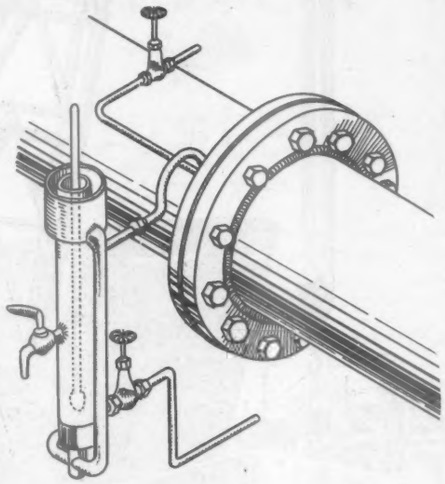


*Fig. 5*

on the walkway. For this reason, the company has installed a third rail half way between the top handrail and the walkway.

Preparing for blackouts, blue electric light bulbs have been installed which can be turned on with a double-throw switch. Flashlights for use during blackout have the lenses covered with a cardboard disk in which there is a narrow slit to reduce the amount of light coming out.

In operating under war-emergency conditions, improved practices which have been devised to increase safety and efficiency will be of growing importance for the pipe-line industry.

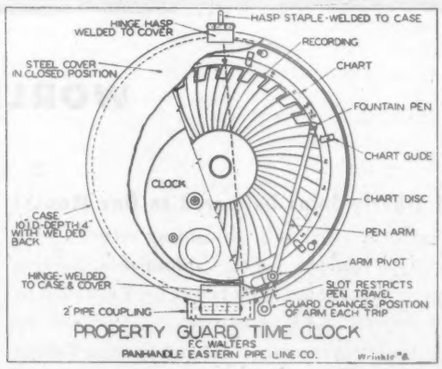
●

## Property Guard Time Clock

By F. C. WALTERS

Superintendent Gas Measurement
Panhandle Eastern Pipe Line Co.

In order to operate a company-wide property-guarding system it is very necessary to have a record of each guard's trips over the property he is guarding. When our company increased the number of property guards during the past few months, we found it necessary to assemble on short notice some sort of equipment for record-




ing post observations since there would have been considerable delay in securing regulation punch clocks.

The attached drawing explains the construction of a quickly assembled and economical device which keeps a recording of the guard's trips to a selected post on the guarded property. The case is padlocked during operation and chart changed by authorized supervisors.

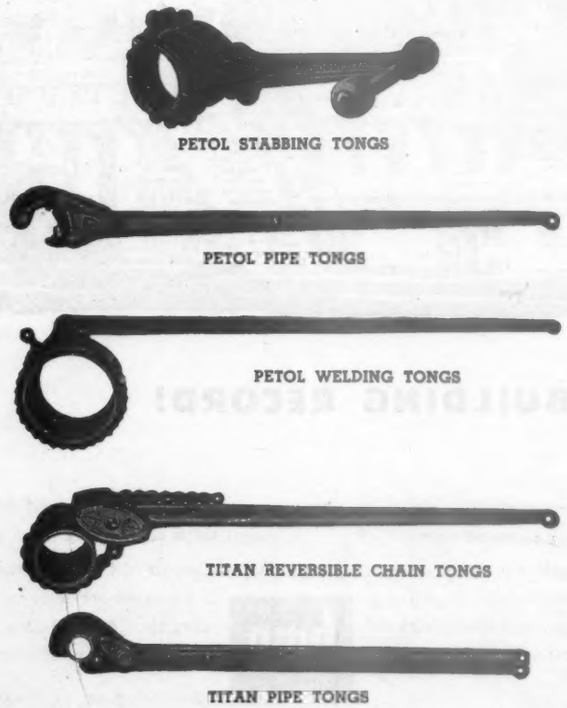
SELECTIONS FROM THE
"Most Complete Line of Tongs in the World"

PETOL TOOLS TITAN TOOLS

WRITE FOR CATALOG NO. 50

28 TYPES
A TYPE FOR EVERY PURPOSE

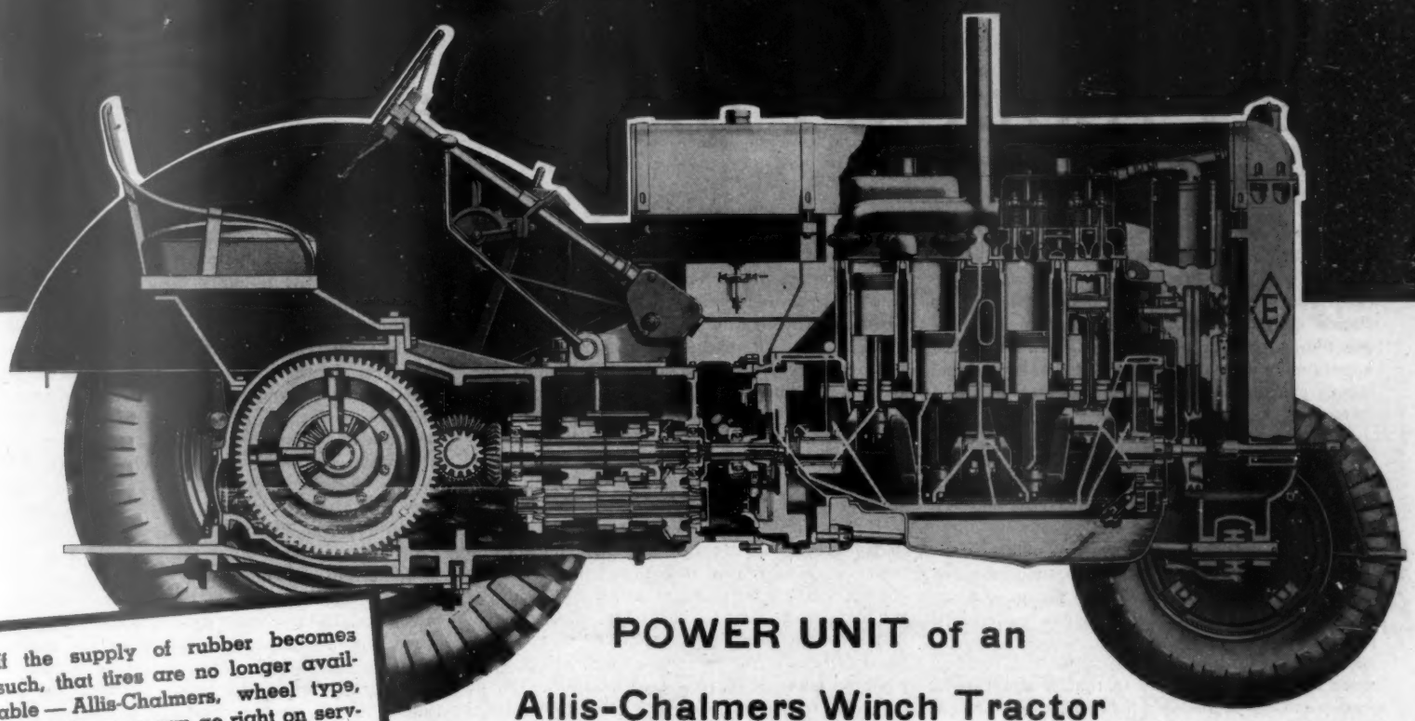
290 SIZES
A SIZE FOR EVERY REQUIREMENT



PETOL STABBING TONGS
PETOL PIPE TONGS
PETOL WELDING TONGS
TITAN REVERSIBLE CHAIN TONGS
TITAN PIPE TONGS

GEARENCH MFG. COMPANY
HOUSTON, TEXAS, U.S.A.
EXPORT: 74 Trinity Place, New York, N. Y.

# SERVICE Equipment for Winter Operation—NOW



POWER UNIT of an
Allis-Chalmers Winch Tractor

If the supply of rubber becomes such, that tires are no longer available — Allis-Chalmers, wheel type, Winch Tractors can go right on servicing your wells.

## IGNITION

SPARK PLUGS: Check, clean and set gap at .020.

WIRING: Check all connections—see that cables are not cracked or oil soaked.

BATTERY: See that terminals are clean and tight. Check water level at least once each week. Keep battery filled to 3/8" above separator plates. Add only clean distilled water.

GENERATOR: Check charging rate; for continuous service set at 7 to 8 amperes; for intermittent service set at 10 amperes to keep battery fully charged. Oil generator bearing with light machine oil every 10 hours of operation.

MAGNETO: Check seasonally; remove and take to authorized magneto service station for checking and greasing.

## COOLING

RADIATOR: Drain and flush, be sure to open drain on engine block and at bottom of radiator. Check all hose and connections to prevent leakage of anti-freeze solution. Fill cooling system with suitable anti-freeze solution. Check level of liquid in radiator daily and keep filled to top of baffle. *Use* radiator curtains to keep engine temperature at between 160° and 180°. *Remember* it is always that first cold snap that is NOT COLD ENOUGH to freeze, that causes so much damage.

**MOTOR CONDITION**

Check compression by turning engine over slowly with hand crank. If compression is weak treat engine with carbon solvent. If this does not remedy condition, clean-out carbon, grind valves and replace rings or install pistons and sleeves if necessary.

## LUBRICATION

PRESSURE GUN FITTINGS: Should receive Semi-Fluid Lubricant every 10 hours of service.

TRANSMISSION: Requires SAE-90 in winter and SAE-140 in summer. Check oil level every 10 hours of operation. Drain, flush with light oil and refill each fall and spring. Drain plug is located under transmission case.

CRANKCASE OIL: Should be clean and of good quality. Viscosities for atmospheric temperature ranges should be as follows:

| Temperature Range | Viscosity |
|---|---|
| 90° and above | SAE 40 |
| 32° to 90° F | SAE 30 |
| 10° to 32° F | SAE 20W |
| —10° to 10° F | SAE 10W |

Remember a high quality oil is cheap engine insurance.

FRED E. Cook Co. Hale Station, TULSA, OKLAHOMA

# Suction and Discharge Control Of Products Pipe Line

By J. W. BOYD
Assistant Manager, Gasoline Pipe Line Department, Phillips Petroleum Co.

A PRODUCTS pipe line is operated by Phillips Petroleum Co. from the Panhandle of Texas to the St. Louis and Chicago area. The line is nearly 1,000 miles long with 27 pump stations located approximately 35 miles apart. Each pump station consists of three or four units. All units use natural gas or butane gas for fuel and are approximately 300 hp. They drive centrifugal pumps at 3,600 r.p.m. by means of step-up speed increasers.

Houses are furnished for the individual pump-station employes. Each house consists of four rooms and is modern in every respect. In addition, each employe is allotted space for gardening to provide for his particular needs.

With the exception of terminal points, each pump station pumps directly into the intake of the following station without the use of a surge tank at the station. In this manner it is therefore possible to handle high-vapor-pressure products, such as butane, without difficulty. It is furthermore a distinct advantage in that if any time a station has one unit down for repairs, the preceding station can carry a part of the load by giving the following station a higher intake pressure, in the neighborhood of 200 or 300 lb., in order to partially compensate for the unit which is down for repairs. Therefore, the necessity for spare units is not as great in a system of this character as it would be if surge tanks were used at each station and each station had to carry its own load. Normally the intake pressure carried at the stations is from 10 to 50 lb., depending on the vapor pressure of the product handled.

In operating gas engines, it is necessary to shut a unit down for checking and for minor repairs at regular intervals and such shutdown disrupts the operating pressures on the entire section of the line. As a change of products is passing through any section of the line, the pressure condition between the stations is changing since a lighter product will show a lower pressure drop than a heavy product at the same rate of flow. The need has therefore been felt for an automatic pressure control in order to maintain a more constant intake and discharge pressure. There are, of course, several types of pressure controls on the market but due to the large number of stations, a control was desired which was comparatively simple and would require little attention.

The Bourdon tube type of air-operated control was therefore chosen on account of its simplicity. Experience has proven that although this type of control is not as accurate as some other types, it is sufficiently accurate for the purpose for which it is used. One instrument is installed to control the intake pressure and a duplicate instrument to control the discharge pressure. The station intake pressure is connected to the Bourdon tube and air or gas is used for the operating medium. A diaphragm-operated motor valve is attached to the engine throttle to change the speed on the engine. The air or gas, depending on which is available at the station, is reduced to a constant pressure of about 10 lb. at the instrument. The air then passes through a small orifice on the instrument after which it is transmitted over the top of the diaphragm on the motor valve which is located in the engine room. Between the orifice and the motor valve, the instrument has a small bleeder. The amount of air bled off at this point is controlled by a flapper which is operated by the Bourdon tube. The construction of the discharge control is the same except that it is reverse acting. A detailed print shows the action of the suction and discharge control.

In actual operation, the intake control is set at the desired pressure and if the discharge limit which can safely be carried on the line is 1,100 lb., the discharge control is set at 1,090-lb. pressure. As the pumping rate increases, there is a tendency for the intake pressure to rise and as this intake pressure rises above the setting of the control, the flapper on the intake control partially closes the bleeder and thus increases the air pressure on the top of the diaphragm which speeds up the engine and reduces the intake pressure to the setting of the instrument. This, of course, increases the station discharge pressure and when the discharge pressure reaches 1,090 lb. the discharge control then becomes operative and bleeds off the air pressure from the top of diaphragm and thus reduces speed of the engine.

It can therefore be seen that the intake control is operating and controlling the intake pressure only when the discharge pressure is below the maximum. The discharge control is operating only when the discharge pressure is at the station limit and during this time the intake control is inoperative. In case the intake is above the setting of the instrument and the discharge pressure is not up to maximum, the engine is prevented from overspeeding by the conventional mechanical governor.

In order to accurately control intake pressures, a 0 to 200-lb. Bourdon tube is used which requires that the intake controller be cut off the line if the intake pressure goes over 200 lb. In order to illustrate the simplicity of this device, there have been a few cases where the intake pressure exceeded 200 lb. and the instrument was not cut off the line. The result was that the Bourdon tube was distorted but was repaired by the chief engineer at the station. It can thus be seen that this type of instrument does not require trained personnel to keep in proper condition.

The results using the automatic pressure control are, first, that it gives a greater capacity through the line since a station can carry either its minimum intake through 24 hours of operation or its maximum discharge which cannot be obtained consistently with manual operation. It is also an added safety device for protection against low-intake pressure or high-discharge pressure in addition to the over or under-pressure controls on the station.

The motor valve mentioned above is used in some cases to change the speed of only one engine at the station and in other cases all engines in the station are hooked up to this one motor valve and the speed of all engines changed at the same time. It is sometimes objectionable to change the speed on only one engine with the control since a comparatively large change of speed is required and if this unit is driving a d.c. generator, the voltage requires considerable attention if automatic voltage control equipment is not used. If the speed of all three engines is changed simultaneously, the amount of change is quite small and has very little effect on the voltage of the generator.

Only one operator is on duty on the individual shifts. He is required to perform additional work on the premises such as keeping the general appearance of the station neat, lubricating valves, running scrapers, etc.

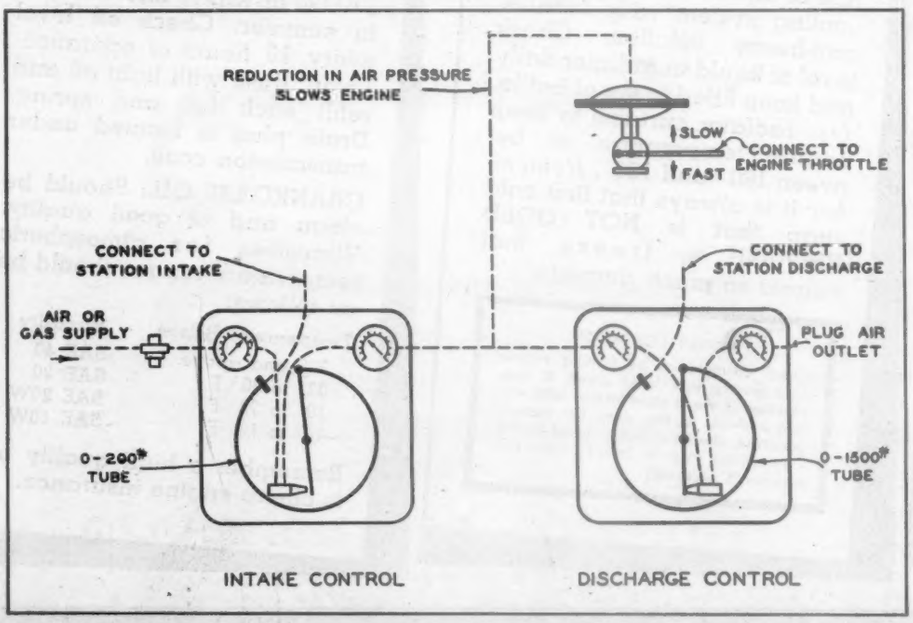
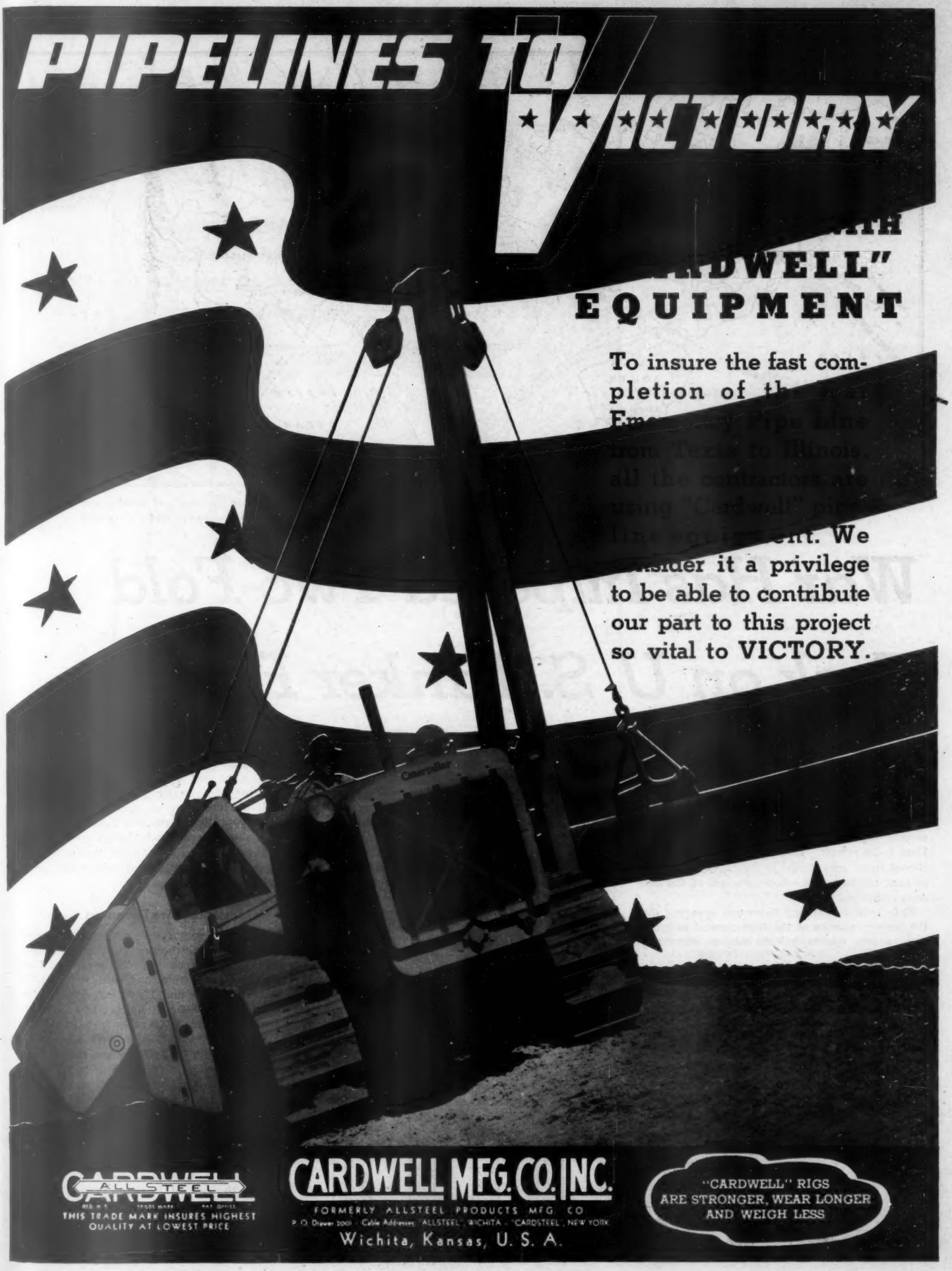



*Fig. 1—Diagram of intake and discharge control equipment for products-line pumps*

# PIPELINES TO VICTORY



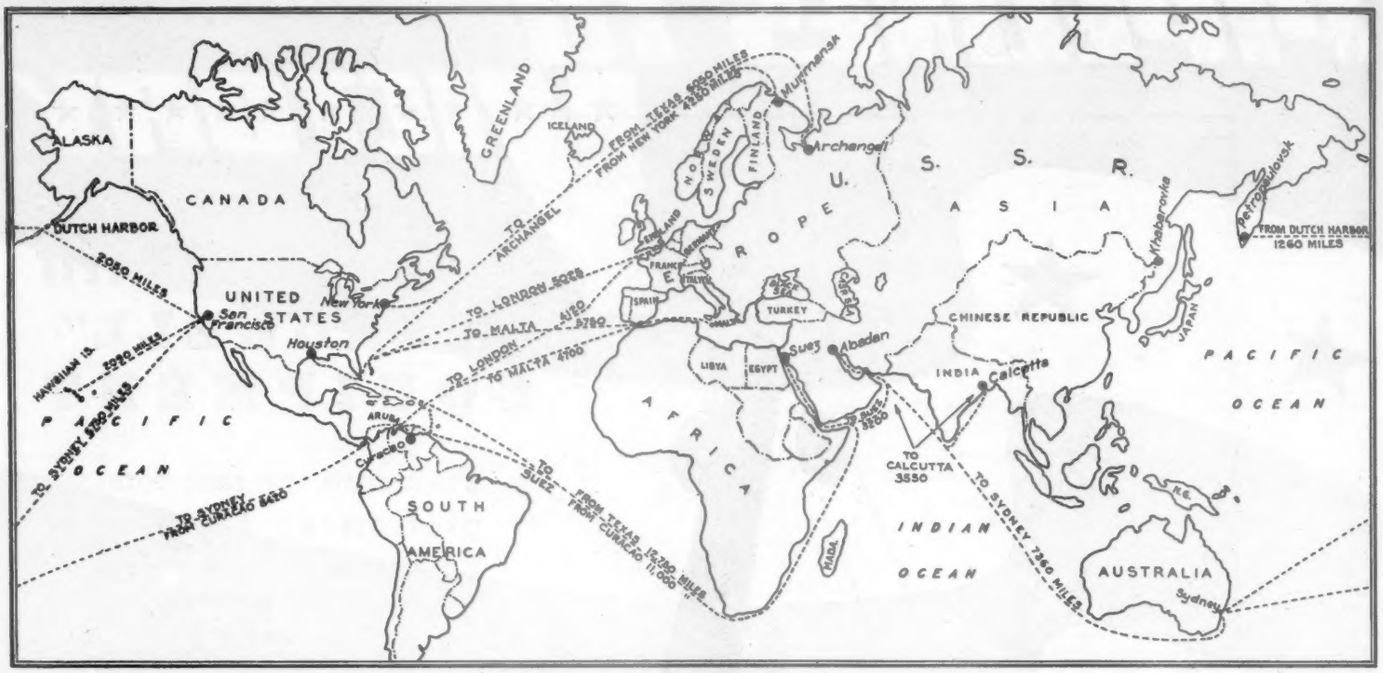
...WELL"
EQUIPMENT

To insure the fast com-
pletion of th...
Em...
...from Texas to Illinois
all the contractors are
using "Cardwell" pip...
line equipment. We
consider it a privilege
to be able to contribute
our part to this project
so vital to VICTORY.

CARDWELL ALLSTEEL
THIS TRADE MARK INSURES HIGHEST QUALITY AT LOWEST PRICE

CARDWELL MFG. CO. INC.
FORMERLY ALLSTEEL PRODUCTS MFG. CO.
P. O. Drawer 2001 - Cable Addresses "ALLSTEEL", WICHITA - "CARDSTEEL", NEW YORK
Wichita, Kansas, U. S. A.

"CARDWELL" RIGS
ARE STRONGER, WEAR LONGER
AND WEIGH LESS




***When the United Nations lost the East Indies and Burma, they were left dependent on the United States, Aruba and Curacao, and Abadan and Bahrein, for oil, all far removed from the active battlefronts which must be supplied by tanker. Map shows routes and distances that are traveled***

# War Has Imposed Two-Fold Task on U. S. Tanker Fleet

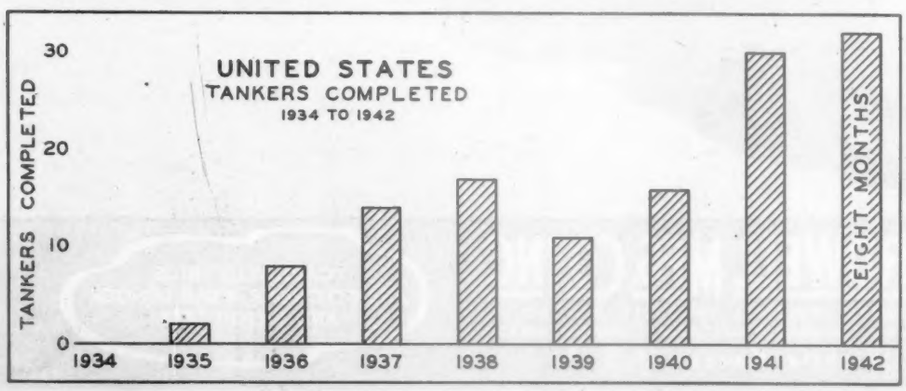
By J. P. O'DONNELL

THE spread of the war to world-wide proportions has set a tremendous task on the tanker fleet of the United States. In addition to delivering oil in convoys to such widely scattered ports as Suez, Calcutta, Sydney, Dutch Harbor, Murmansk and London, it must fuel the Navy's vessels deployed throughout the vast Pacific. That is its primary job and a secondary task of almost equal importance is continuing to supply at least the barest of essential needs of the anti-Axis countries.

More than a year ago it became apparent that the tanker capacity of the then neutral and anti-Axis nations was in delicate balance. Since then the war has spread throughout the western Pacific and deprived the United Nations of their only oil sources in the Far East. Germany conducted a highly successful submarine campaign in the western Atlantic and Caribbean, accounting for more than 2 dozen tankers before reports on losses were withheld. These developments, with their additional demands on tankers, completely upset the previous precarious balance.

Submarine activity required the introduction of the convoy system which substantially reduces the efficiency of a ship, particularly faster boats though slow ones are also penalized by having to wait until convoys are formed. When the United Nations lost the East Indies and Burma, they were left with but three major points from which refined oil products can be shipped: the United States Gulf and West coasts, the Caribbean islands of Aruba and Curacao, and Abadan and Bahrein in the Persian Gulf. All are far removed from the presently active battle fronts which they must supply by tanker.

***Tanker construction so far this year has already exceeded that for the entire year of 1941. By the end of next year close to a billion dollars will have been expended on the present tanker-building program***




### Distances Are Enormous

The most important fronts now receiving fuel from these points are the British Isles, the Southwest Pacific and the eastern Mediterranean. London is 5,025 miles from our Gulf ports, 4,120 miles from Curacao, and 11,300 miles from Abadan by way of Cape Town. Sydney is 9,200 miles from U. S. Gulf ports, 6,750 miles from San Franvisco, 8,420 miles from Curacao and 7,350 miles from Abadan. Suez is 3,200 tanker miles from Abadan, and, by way of Cape Town, 12,750 miles from our Gulf ports and 11,000 miles from Curacao.

Operating such distances as these under convoy requires considerable tanker tonnage, but as heavy as these requirements are, it is possible that they may become a good deal heavier. If Germany succeeds in isolating the Caucasus and its oil from the rest of Russia, the Soviets will need more oil from their allies. It might then be necessary to supply northern Russia almost exclusively through her Arctic ports of Murmansk and Archangel. The latter is 4,250 miles

DO YOU, too, get a "lift" from those other-than-France packings? Then it will pay you to paste the name "France Manufacturing Company" in your hat brim . . . pay you in time gained and money saved by eliminating breakdowns, delays and scored rods.

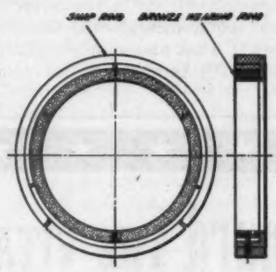
France scientifically designs and makes a variety of packings. Well known are France packings for natural gas compressors but outstanding, also, are France packings for gas engines, special purpose packings for corrosive, deadly or inflammable gases operating under vacuum or pressures up to 15,000 lbs., and another France development — sheathed bronze fire checks for double-acting gas engines. France packings cost no more, last longer and work better.

Next time you have a regular or special job for packing, remember to ask France to help you.

## PACKINGRAM

by

E. A. FRANCE



### SHEATHED BRONZE FIRE CHECK

Packings used in double-acting Gas Engines require buffer rings—called Fire Checks—preceding the pressure sealing rings to retard the intense heat and sudden rise in pressure. These special rings work under the most adverse conditions of heat, temperature and poor lubrication. They must also withstand the oxidizing effect of burning gases.

The mechanical design, dimensions, and metals used in France Sheathed Bronze Fire Check Rings are chosen for the elevated temperatures at which they operate.

Bronze of the proper characteristics withstands the abuse of poor lubrication and will not readily score or wear the rod. Its most important advantage over iron is rapid heat conduction. For three strokes of the cycle it rapidly transfers to the piston rod and packing case the heat absorbed during ¼ of the cycle, greatly reducing the running temperature of the bearing surface.

A protecting sheath of cast iron over one face and outside diameter of the bronze ring protects the bronze from direct contact with the burning gases; absorbs heat 1/9 as fast as the bronze behind it, and covers the open joints of the ring segments. It is far more effective than two independent rings in one groove.

Ring segments are held in contact with the rod by a heat-resisting cast iron contracting spring. The spring ring can be snapped over the diameter of the piston rod allowing the entire unit to be assembled without disconnecting the rod.

France Sheathed Bronze Fire Check Rings show no side wear and no rod wear. None has ever worn out. They may be obtained for installation in existing packing cases.

*CAST IRON RINGS • SCUFF-PROOF CAST IRON RINGS • BRONZE RINGS • CARBON-BAKELITE RINGS • CARBON RINGS*

*Complete line of packing for all gases up to 15,000 lbs. pressure, as well as for superheated steam engines and gas engines.*

FRANCE MFG. CO.

**FRANCE MANUFACTURING COMPANY**

**Belgrade and Orthodox Streets • Philadelphia, Penna.**

*"Don't Take A Chance—Take FRANCE"*

from New York and 6,050 miles from the Gulf. A second possibility lies in a Japanese attack on Siberia. If a Jap attack in the Far East deprived Russia of her Sakhalin Island production and the Khabarovsk refinery, the Soviet Far Eastern Army would need United States oil badly. This oil could be shipped from San Francisco to the Kamchatka port of Petropavlovsk, via Dutch Harbor, a total distance of 2,300 miles. However, Japanese bases at Kiska and other western Aleution Islands would make this route as hazardous as German North Cape bases make the Murmansk route.

### Large Construction Program Under Way

While the supplying of the United Nations' military and naval requirements is the first duty of the tanker fleet it must also supply sufficient oil to allied and friendly countries to maintain a minimum wartime economy. These supplies have been reduced to an absolute minimum and oil is now available only in limited quantities in all of the United Nations except those with an adequate indigenous supply and also with adequate, nontanker transportation facilities.

In order to combat this problem, the United States Maritime Commission and private oil companies are embarked on the greatest tanker construction program of all time. The rate of completions has yet to reach its maximum, but even at that, by end of August there were more than 70 per cent more tankers completed in domestic shipyards than in all of 1941, previously the best tanker construction year since the ebb of the first World War boom. Tankers have been completed at the rate of slightly more than four a month so far this year. This rate is expected to be stepped up in the last months so that by the end of the year it is hoped that more than 100 tankers will have been completed under the commission's program and by private companies. Tankers are the most important single cargo ship in the country's great shipbuilding program but the rate of completion is necessarily slower because of their more complex design. It is estimated that the average tanker requires 5,000 to 6,000 tons of steel, which compares with 3,400 tons for the so-called Liberty ship which makes up the principal portion of the Maritime Commission program.

### Types of Vessel

The bulk of this year's completions will consist of many of the T2-SE-A1 type which constitutes the greatest part of the commission's program. Around 200 of these are scheduled for completion before the end of 1943. The majority of them are being built at the expanded yards of Sun Shipbuilding & Dry Dock Co., Chester, Pa. These are single-screw, turboelectric drive tankers of 10,750 gross tons having a capacity of 138,000 bbl. They have an over-all length of 503 ft., a beam of 68 ft. and a depth of 39 ft. 3 in. Their power plant is rated at 6,000 hp. and they have a normal speed of 14½ knots.

In addition to these vessels, the commission has 32 coastal tankers on its program, all of which are scheduled for delivery by April 1943. These will be of 1,830 deadweight tons and will have a capacity of 12,800 bbl. Their over-all length is 220 ft., the beam 37 ft., and the depth 14½ ft. They will have a single-screw direct-driven diesel drive and are expected to develop 10½ knots.

Outstanding in the commission program are the 14 Cimarron type tankers being built at Bethlehem Steel Co.'s Sparrow Point, Md., yard. These are duplicates of the 12 built by Standard Oil Co. of New Jersey for the optional use of the Navy in 1939 and 1940. They are 18,000-deadweight-ton tankers with a capacity of 150,000 bbl. and a speed of 18 knots which make them the largest and fastest afloat. At today's prices the present tanker building program is estimated to involve a sum closely approaching $1,000,000,000.

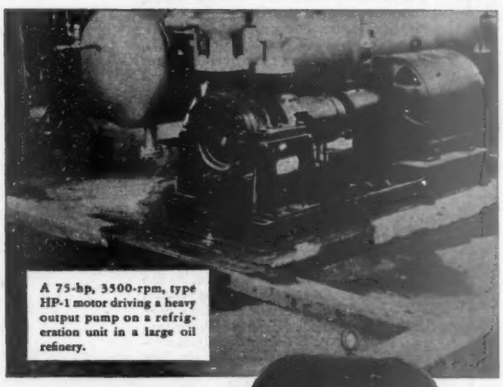
### Survives Repeated Attacks

The large and fast tankers of the Cimarron type are especially desirable as Navy oilers and for supplying difficult bases. Typical of the latter assignment was the use of the Texas Co.'s Ohio recently in a Malta convoy. The Ohio, of 13,300 deadweight tons, was completed in 1940 and has a capacity of 107,000 bbl. Her rated speed was 16 knots, but on a trial run she hit a top speed of 19.23 knots and has averaged 17 knots in making the 1,880-mile Bayonne, N. J.-Port Arthur, Tex., run. According to reports of the trip to Malta, the Ohio, because of the tanker's distinct design in a group of regular cargo carriers, was a marked ship. She was first torpedoed, then caught a falling Stuka dive bomber and was bombed continuously for 2 days. At least one bomb was a direct hit, starting a fire that finally was brought under control. There were reported to have been literally hundreds of near misses that would have started the seams or capsized a normal vessel, but the Ohio survived and managed to reach port, a tribute to American design and construction.

Alleviation of the submarine threat along our Atlantic Coast, the rising rate of tanker construction and other factors such as the reported plan to take some 40-odd petroleum-carrying Great Lakes boats and put them in coastwise service put a somewhat better appearance on the tanker situation than has been evident for several months. However, this is only the beginning of the improvement, possibly not even that, and the time when ample tanker capacity will be available for nonmilitary purposes is still distant.


★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

# Safeguard THE VITAL FLOW OF OIL AND GAS —put WAGNER MOTORS on the job



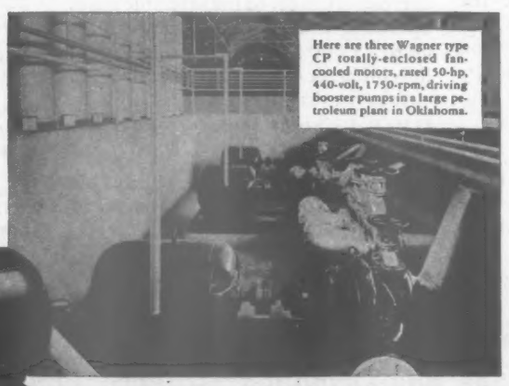
A 75-hp, 3500-rpm, type HP-1 motor driving a heavy output pump on a refrigeration unit in a large oil refinery.

An ever-increasing flow of oil and gas is vital in the winning of this war. Drilling, pumping, cracking and refining must go on uninterrupted. Equipment must operate full speed, 24 hours a day, 7 days a week, if we are to achieve our goal—victory.

Because of their dependable trouble-free performance under the most severe operating conditions, Wagner CP and HP motors are the first choice of the petroleum industry. They fit right into the job. Wagner sales and service branches are located in 25 principal cities. Field engineers in each of these branches are at your service. Their experience in the petroleum industry can be of help to you in the selection of the right Wagner motors to safeguard the vital flow of oil and gas.

## WAGNER Type HP MOTORS

Wagner HP motors are tested and approved by Underwriters' Laboratories for Class 1 Group D hazardous locations where gasoline, naphtha, alcohols, acetone, lacquer solvent vapors and other inflammable liquids are manufactured, used, handled or stored. Hence they are ideally suited for the petroleum industry. However, meeting Underwriters' standards is not the only factor considered in the building of Wagner Explosion-proof motors. Wagner HP motors are designed and built to give many years of trouble-free service under the most severe operating conditions to which explosion-proof motors are subjected.



Here are three Wagner type CP totally-enclosed fan-cooled motors, rated 50-hp, 440-volt, 1750-rpm, driving booster pumps in a large petroleum plant in Oklahoma.

## WAGNER Type CP MOTORS

Wagner CP motors are designed specifically to operate under severe adverse conditions in atmospheres that contain dust, dirt, corrosive fumes and moisture. They have two-frame construction—one frame guiding a strong stream of cooling air over the motor, and another frame completely sealing the windings, rotor and bearings from the outside air. This construction enables Wagner CP motors to operate for years without maintenance (other than periodic lubrication) in locations that would render open type motors useless in a very short period of time.

*Send* FOR BULLETIN MU-182 which fully describes the mechanical and electrical characteristics of Wagner CP and HP motors.

M42-17

Wagner Electric Corporation

6400 Plymouth Avenue, Saint Louis, Mo., U.S.A.

MOTORS • TRANSFORMERS • FANS • BRAKES

# Methods Used for Dealing With Synchronizing Pump Troubles

SINCE the advent of synchronized pipe-line pumping with its accompanying advantages one rarely hears mention of any of the problems that this method of relaying the stream has introduced.

Under the original scheme of relay pumping, float tanks or receiving tanks at each station were auxiliary to a design that made each section of line between stations an independent circuit. Breakdowns of machinery or line interruptions did not force a shutdown of all stations unless the initial point happened to be the incapacitated station. Hence pumping could be continued until the float or receiving storage was filled or a product change prohibited further pumping until repairs were completed.

Product pipe lines fostered closed-circuit pumping because such a method not alone provided a product substantially the same in specification as that tendered but it also decreased the transportation time between origin and destination.

The vast quantities of diverse products moved by common-carrier pipe lines made it economically impossible to provide the separate lines and receiving storage at each pumping station for the different grades and tenders, and if such facilities had been built the complexity of piping ramifications would demand extreme operating caution to prevent admixing between characteristically varying products. It is readily apparent that common-carrier lines do not enjoy the advantage of plant-facility systems and consequently cannot dictate to their shippers a schedule of product graduation wherein the progression is such that adjacent tenders en route have practically no contaminating influence on each other. The common carrier must be prepared to pump any material within the specification pale.

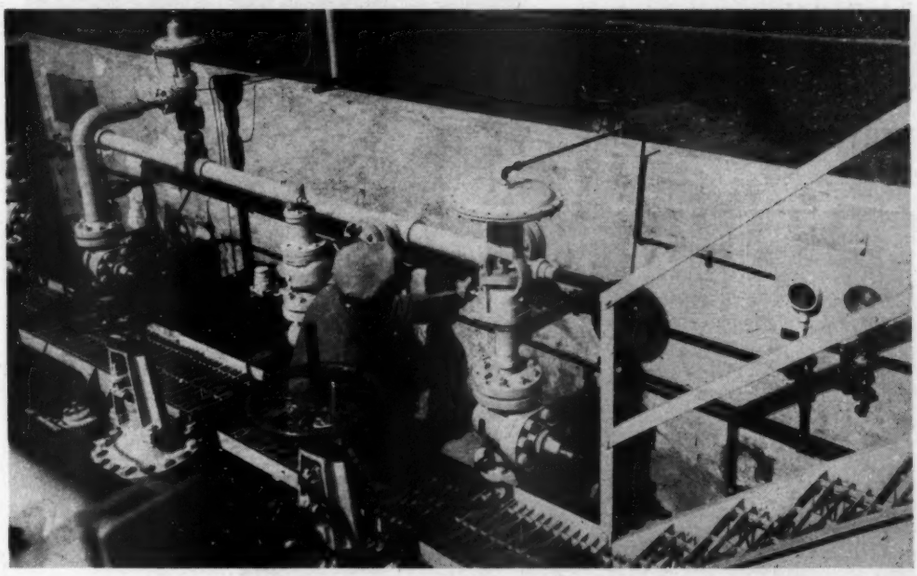
In the synchronized pumping the column moves as a unit entity over a pipe-line traverse of several hundred miles; the flow is usually turbulent and in a nonmetered system shortages or leaks are disclosed indirectly by a loss of discharge pressure. Hence it is necessary to install meters together with their kindred equipment to insure a strict record of line flow. Meters that show the monetary rate of flow in barrels per hour have some advantage over those that totalize since fluctuations in line capacity are immediately apparent if the instantaneous throughput deviates from the standard for a fixed pumping pressure.

Synchronized pumping has long since been an accepted practice in systems where electrical powered centrifugal pumps are universally installed. The speed is fixed and stream throttling can be automatically resorted to as a compensating medium to balance the flow rate in consecutive sections if the hydraulic or other conditions tend to cause instability.

### Control of Engine Units

With engine-powered centrifugal pumps the control is not as easily maintained unless supersensitive engine-governing equipment is available. If, for example, an engine is coupled through a stepup gear with a 4 to 1 ratio, to a pump turning at 3,600 r.p.m and the engine-governor sensitivity is limited to 3 per cent, the expected speed loss of the engine in coming from no load to full load would be 27 turns per minute. Since the capacity of a centrifugal pump varies directly as the speed, an engine loss of 27 r.p.m. with a subsequent pump loss of 108 r.p.m. would be 3 per cent in throughput capacity. It would not be possible to maintain a balanced flow rate through a series of relay stations with insensitive governing equipment such as this unless float surge tanks were available.

With sensitive governing equipment properly controlled by the stream pressure it is possible to regulate the flow rate as a constant between successive stations. Surge tanks are not needed in such a scheme and only small relief tanks capable of holding a couple of hundred barrels are needed to receive momentary liquid excess if a failure should force a station out of service.



*Air-operated high-pressure relief valve. The liquid relief end is connected to a small tank.*

In reciprocating-pump service the conventional spring-loaded relief valve on the high-pressure stream has its disadvantages, particularly where high-pressure surge chambers are not installed; because the operating pressure is so close to the limiting pressure that actuates the relief valve it is a common occurrence to find peak pump pressures causing the spring-loaded valve to open slightly. With this occurring several times each hour the capacity of a relief tank is quickly filled, very often with products of varying characteristics, and a resulting composite that is not marketable.

A relief valve that is better suited to circuit pumping is a relay type usually air operated arranged for air to close. Since the air pressure, generally at 15 to 20 lb. per sq. in., holds the valve in a closed position, any fracture of the air column line bleeds the diaphragm head and permits the valve to open.

In actual operation when excessive pipe-line

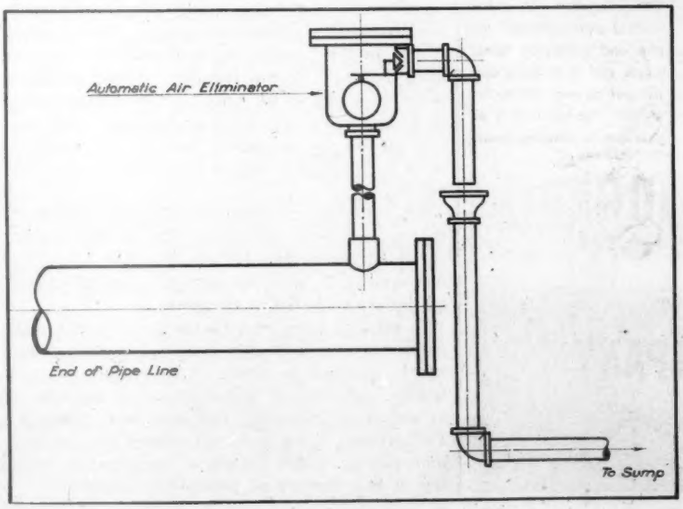



*Fig. 1—Automatic air vent installed to conform with this arrangement will prevent speed surges caused by air. It will function only as effectively as the maintenance it receives.*

★ ★ ★ *Two UNIQUE Pumps for the* OIL INDUSTRY

THE ALDRICH-GROFF "POWR-SAVR" CONTROLLABLE CAPACITY PUMP

- PIPE LINE SERVICE
- PROCESS AND STILL CHARGING
- PROPORTIONING
- CENTRALIZED PUMPING

High mechanical reliability combined with low power consumption proportional to varying output demands and a ready accessibility of all totally enclosed and pressure lubricated parts have made this pump a favorite with oil operators. Provides for automatic or remote manual control of delivery from zero to full rated capacity at constant pump speed. For pressures from 200 to 15,000 p.s.i. Write for Data Sheet 65.

★

THE ALDRICH *INVERTED* VERTICAL TRIPLEX PUMP

◀ Fluid end located at top of pump frame. Totally enclosed with provision for outside packing and lubrication under all operating conditions. Crankshaft extends through crankcase for direct coupling at floor level. Outboard plungers can be sealed dust and weather tight with a removable cover. For pressures to 8350 p.s.i. and capacities to 200 G.P.M. Write for Data Sheet 66.

*Other standard and special vertical and horizontal triplex and quintuplex types; single and multi-stage centrifugal pumps. Write for bulletins, giving details of your specific pumping needs.*

BUY WAR SAVINGS STAMPS AND BONDS!

THE ALDRICH PUMP COMPANY

ALLENTOWN • PENNSYLVANIA

pressure builds up a Bourdon tube or tubular helix, coupled to the line, expands sufficiently to open a bleeder and release the air column holding the relief valve closed, following which the liquid end of the valve immediately opens wide and permits the excess fluid to escape to the relief tank.

Air for this service should be dehydrated by pumping it through calcium chloride activated alumina or some comparably effective desiccant to prevent moisture freezing on the diaphragm in cold weather. Under certain conditions it is advisable to fill the diaphragm head with an antifreeze liquid and use only a very small volume of air.

At stations where several units deliver to and receive from common lines all may be fixed speed except the one that compensates for fluctuations in suction pressure. It constantly changes its pumping rate to follow variations in the flow rate and thus smooth out the suction-pressure conditions. The compensating unit should not be used to generate d.c. electric power because its constant speed changing causes the voltage to vary within a wide range and even if a suitable voltage regulator is provided hunting of the motors energized from the circuit is the effective result.

In starting a series of stations it is always desirable to start one unit at consecutive locations in an uninterrupted progression beginning at the initial and ending at the terminal point, and when the stream has attained forward momentum additional units may be connected to the circuit in the same order as the original. It is mandatory, of course, that the compensating unit be started first at all stations with the fixed speed units following.

To prevent liquid density variations from affecting the head pressure on the suction control and also arrest corrosion it is customary to fill the line between the product stream and the actuating bellows at the governor with a liquid such as ethylene glycol inhibited to prevent corrosion. This scheme insures that liquid of a constant density will always be in contact with the pressure-operated mechanism.

In main-line pipe maintenance where it is necessary to renew a run of bad pipe a condition may arise many hours following a repair that can cause erratic behavior of the pumping units down stream from the repair.

If any appreciable quantity of pipe is removed and particularly if a considerable run of line has been drained to provide a dry cut it is evident that a long air column is usually trapped between two columns of liquid. The air initially decreases in volume in accordance with Boyle's law as it moves on towards the downstream station. It constantly expands to a volume proportionate to the pressure on either side of it, thus maintaining a balance. But when it reaches the downstream station, and this is particularly true where reciprocating displacement pumps are standard, it lies in the suction line and through compression, because of the inability of the pump to move it, it starts to speed up the compensating unit. As a consequence the line pressure increases and if the compensating unit is not equipped with an overspeed stop a disastrous wreck may result.

An automatic air vent installed to conform to the arrangement shown in Fig. 1 will prevent speed surges caused by air, but like all things mechanical, it will function only as effectively as the maintenance it receives.

In product lines where a multiplicity of specification-varying materials are in transit it would not be possible to preserve the identity of each tender and deliver uncontaminated material if synchronized pumping had not been perfected. For product lines, and particularly for the common carrier in this branch of the pipe-line industry, it is a feature of paramount importance.

# Drip Equipment for Natural Gas Transmission Lines

By GEORGE CASH
Assistant Superintendent, Godfrey L. Cabot, Inc., Cabot Gas Corp.

FOR a great many years in the past it has been the practice of the gas industry to make transmission-line drip installations on the downstream side of sags. The pressure at which the line is to work, together with the quantity of gas to be handled, have controlled the position of the drip. The contour of the ground has also been a factor.

If the velocity of the gas stream is great and the slope up from the sag very gentle, the drip might be located as much as 300 ft. beyond the lowest point on the sag. On the other hand, for the same conditions of gas flow, if the slope up from the sag is steep the drip may be located no more than 50 ft. from the bottom of the sag, but at approximately the same relative vertical position as described in the first case.

There is no mathematical formula that will solve the problem of the ideal position of a drip. The position is usually selected by an operating superintendent whose years of practical experience guide him in the selection of the site. Sometimes it is immediately found that the first position selected for a drip is wrong. In this event it is not usually advisable to take up and move the old drip, but a new one should be installed above or below the initial drip depending upon the position of the liquid accumulation.

It has very often been demonstrated that conditions of flow of gas in pipe lines do not remain fixed over a period of years. Flows may be very greatly diminished or they may be completely reversed. With such changes it becomes patent that drips installed as previously discussed will be in the wrong position under the new conditions.

### Location of Drips

Experience has led the writer to believe that during the construction of a pipe line the first drip to be installed in a sag should be installed with the low end of the drip not higher than the low point on the pipe line. In fact it would be better if the drip straddled the sag.

Our experience in handling Oriskany gas at high pressure and in very considerable quantities in the New York-Pennsylvania area dates from 1935, but it was not until 1937 that we constructed a 14-in. pipe line from the New York-Pennsylvania State line to Rochester, N. Y. From 1935 to and through 1937 additional reserves were found, and it was thought that conditions of flow in the pipeline system would remain fairly constant except for some seasonable change for a considerable period of time. We were thus guided to locate the large drips on the line at points some distance upgrade on the downstream side of the sags. The line was operated for approximately 1 year before it was found advisable to supplement the first three drips with additional larger drips installed between the first drip and the sag.

Double drips of the type shown by Fig. 1 were decided upon. In the first sag on the line the site selected for the large drip was about midway between the original drip and the sag. The auxiliary drip in the second sag was placed about 20 ft. beyond the sag. The drip in the third hollow was located squarely in the bottom of the hollow which is very deep.

Most of the moisture was collected in the first sag which is approximately ¼ mile from the compressor station. Conditions were such that it should have been collected at that point. The compressed gas was being mixed with cold gas immediately upon leaving the bent-tube coolers; moisture forming at the mixing point was carried by the flow down hill to the drip; change in direction of flow and divided flow in the large drip accounted for more deposition; and finally the very materially reduced velocity through two 14-in. legs and two 24-in. legs, in addition to the fact that the 24-in. legs were exposed to the atmosphere, created a distinct chilling effect resulting in additional deposition of moisture as liquid.

Since the winter of 1939, greatly reduced flows resulting from the depletion of the Oriskany gas fields in northern Pennsylvania and southern New York have proved to us that neither of the two drips installed in the first sag on the 14-in. line is in the correct position. Very little moisture is collected now in either drip. We have since installed a drip pot at the lowest point on the line. The drip pot drains into a large water catch and the liquid is siphoned from the water catch to a point on our station property 1,000 ft. away. At the outset had the very large drip been installed at the very bottom of the sag, it is my opinion our moisture problem would have been solved.

### Types of Drips

On this particular transmission line drip pots consisting of 6 by 2-in. welding swages, 2-in. welding ells, 2-in. nipple, and 2-in. 800-lb. working-pressure valves were installed at each sag, except those in which drips were installed, occurring on the south 36 miles of the line. No accumulation of moisture was ever found beyond a point 9 miles from the south end of the line. An interesting observation might be made here. At a point near Wellsville, N. Y., approximately 10 miles from the southern terminus of the line in question, gas temperature as low as 25° F. have been

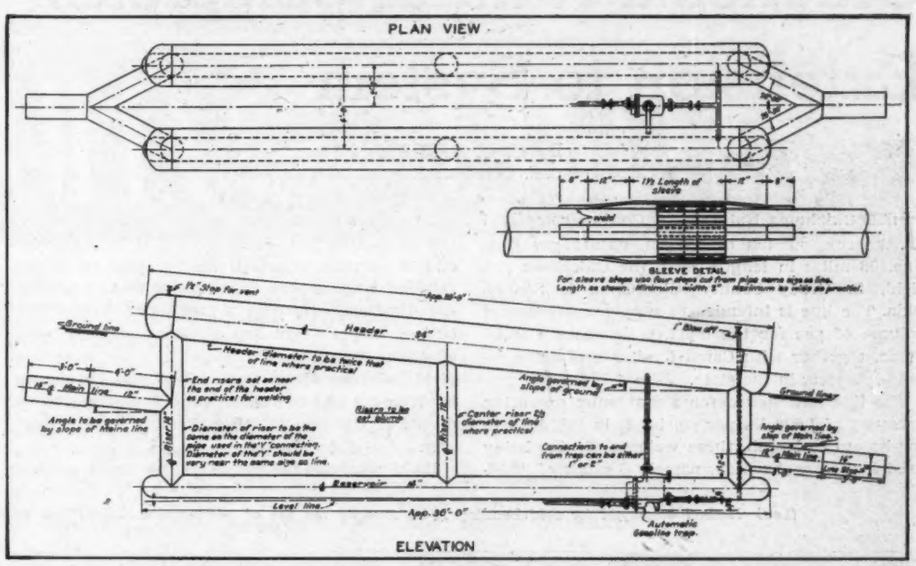



*Fig. 1—Double stepladder type pipe-line drip used ahead of compressor stations*

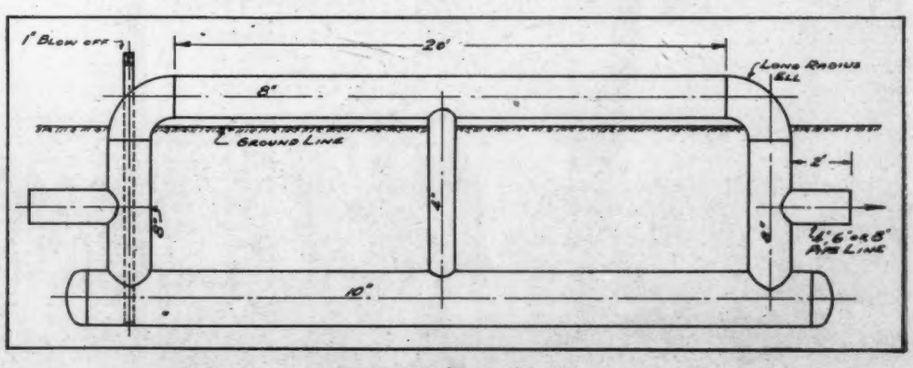



*Fig. 2—Type 2-B pipe-line drip*

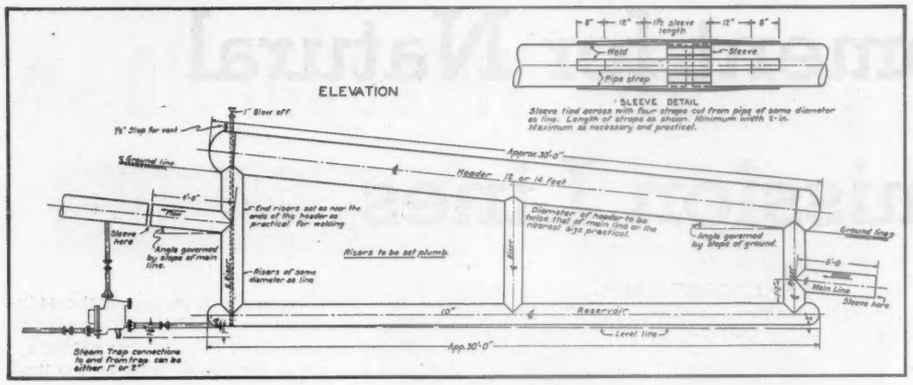



*Fig. 3—Stepladder type pipe-line drip for use in field lines*

recorded when large quantities have been flowing.

The function of a drip is of course to collect moisture. To accomplish this most effectively three conditions should be satisfied. The drip should slow down the velocity of the gas stream, change the direction of the stream, and lower the temperature of the stream. In practically all transmission line drip installations made by my company in the past 5 years, we have held religiously to designs which, in our opinion, would fulfill these conditions.

Fig. 2 shows a type drip that we have used extensively. At the outset we operated with the top leg buried, but very soon began making installations with the top leg exposed to the atmosphere to take advantage of the chilling effect of the atmosphere. This type drip has been used principally on 4 to 8-in. gathering lines.

Fig. 3 shows a later type adopted as standard. It has advantages over the Type 2-B, the principal one being the large cross-sectional area of the top and bottom legs. The illustration shows a steam or gasoline trip forming a part of the installation. Where large quantities of liquid are found to accumulate in drips, such an automatic trap forms a very valuable part of a drip installation.

# Oklahoma Natural Completes Extension to System

By C. U. DANIELS
Vice President, Oklahoma Natural Gas Co.

THE Oklahoma Natural Gas Co. has completed the construction of a 12-in. natural-gas pipe line, 96 miles in length, from the Chickasha gas field, in Grady County, Oklahoma, to Stroud, Okla. The line is intended to supply a substantial volume of gas for the markets in eastern Oklahoma, together with Camp Gruber and other defense projects in the state.

The line is designed for a maximum operating pressure of 1,000 lb. per sq. in. It is 12¾-in. o.d. for its entire length, three weights of pipe being used in its construction, namely 8 miles of 41.50-lb., 13 miles of 37.45-lb., and 75 miles of 34.55-lb., the heavier sections being located at the upstream end of the line. Grade B electric pipe in double random lengths was used throughout. The pipe specifications called for a maximum carbon content of 0.30 per cent and a minimum yield point of 45,000 lb. per sq. in. However, the minimum yield point on actual tests was 51,500 lb. per sq. in. Welding end lubricated plug valves are to be placed in the line at approximately 8-mile intervals.

E. M. Campbell & Co. of Tulsa were general contractors on the job. The pipe was laid by the stovepipe method and electric welding was used. In the welding, a ⅛-in. stringer bead was run which was followed by one 5/32-in. and two ⅜-in. beads. The terrain covered by the line is generally rough, requiring considerable bending. All bends were made cold. The line was laid with a minimum of 28 in. of cover.

The first pipe was laid on May 19 and the last on August 26, an elapsed time of 100 days, 76 days of which were working days.

In connection with the pipe line, there are now under construction two suspension bridges, a gathering system in the Chickasha field, and a dehydration plant. The two pipe-line bridges are over the North Canadian and South Canadian rivers. Both were designed by Matthews & Kenan, consulting engineers, San Antonio, Tex., and are being erected by the Pittsburgh-Des Moines Steel Co. of Des Moines, Iowa. The South Canadian River bridge will be made up of one span of 1,760 ft. and a loaded backstay of 880 ft., a total of 2,640 ft. The North Canadian River bridge will consist of one span of 360 ft. Construction of both bridges has been under way for some time and they will be completed this fall.

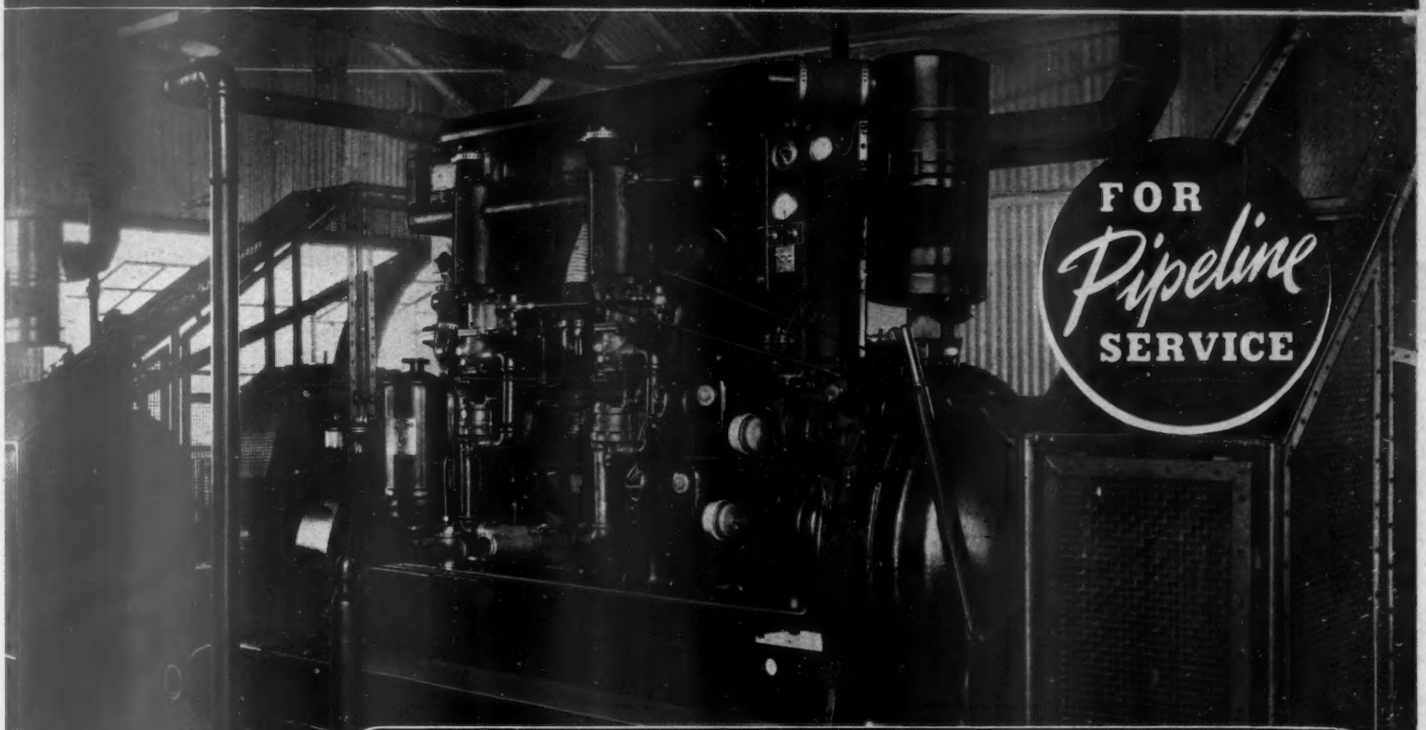
The gathering system in the Chickasha field is made up of 4 miles of 6-in. and 1¾ miles of 8-in. pipe and is designed for 2,000 lb. working pressure. Separate lines were laid from each well, all lines converging at a central point. This point the rates of flow from the individual wells will be controlled, the production measured, and the gas dehydrated. The gathering lines were laid to a minimum depth of 5 ft. to obtain the advantage of higher soil temperatures, thus helping eliminate the formation of hydrates. Automatic indirect heaters are installed at the wells to further alleviate hydrate trouble.

Inasmuch as the formation point of hydrates is about 62° F. at 1,000 lb. pressure, it will be necessary to dehydrate all of the gas entering the 12-in. line. Both the diethylene glycol and the solid absorbent types of dehydration plants were considered. At the maximum working pressure of the line the estimated performance of the diethylene glycol plant would be on the border line of safe operating conditions due to the limited dew-point depression obtainable. With the solid absorbent type of plant a dew point considerably below that needed can be readily obtained. For this reason the solid absorbent type of plant was chosen. The plant has been designed by J. F. Pritchard & Co. of Kansas City and it is to be erected by them.

The valves have not yet been placed in the pipe line and upon their installation and the completion of the two bridges the line will be tested and placed in operation.

*(Left) Method employed for cold bending 12-in. pipe by the use of two tractors. (Right) Pipe on skids over the ditch ready for lowering in*

# Here's the POWER You Need




# CLIMAX *Blue Streak* ENGINES

All features and accessory equipment which oil country service and experience has dictated as being necessary for long life and efficient operation have been adopted as standard equipment for Climax ***Blue Streak*** Engines.
Check these outstanding features:

- **Dual Carburetion** for maximum efficiency and smooth operation.
- **Dual Magneto Ignition** with **Dual Spark Plugs** provides highest power output and greatest dependability.
- **Gasoline Engine Starting** for greater efficiency.
- **Safety Power Take-Off Support** for a more rigid power take-off mounting.
- **Water Cooled Exhaust Manifold** for safety.
- **High Capacity Cooling System** for positive cooling at all times.
- **Special Oil Field Type Steel Skids** for greater ease in handling.

Nothing has been overlooked to make Climax Power Units the ultimate in Prime Movers, which accounts for their high economy and low maintenance.

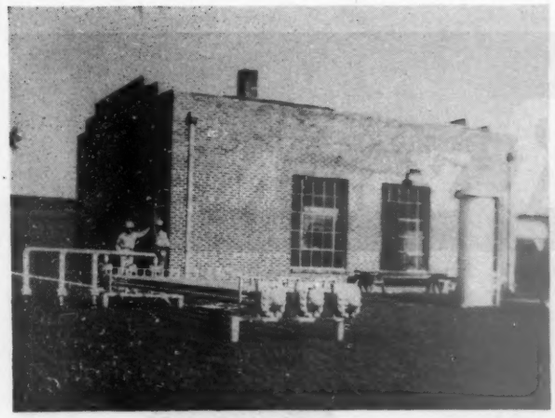
**THE CONTINENTAL SUPPLY COMPANY**
General Offices: DALLAS, TEXAS
*Foreign Sales Subsidiary*
**CONTINENTAL EMSCO COMPANY, Inc.**
30 Rockefeller Plaza New York City, N. Y.
*Representatives:*
LONDON MARACAIBO BUENOS AIRES TRINIDAD

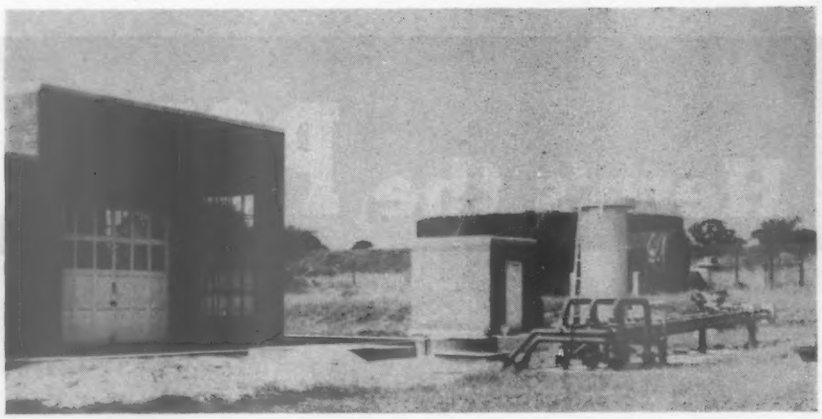
Buy U. S. WAR BONDS & STAMPS

30th ANNIVERSARY
1942
CONTINENTAL SUPPLY CO.

# CONTINENTAL

**SERVING THE OIL AND GAS INDUSTRIES**



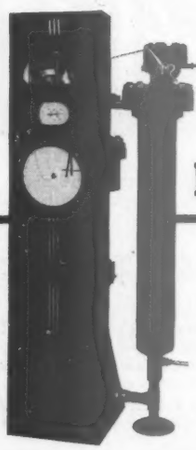


*Left: Hoosier station, west of Cedarvale, Kans. Right: Ramsey station, west of Copan, Okla. Views show heat exchangers for cooling engine-jacket water and evaporating tower for cooling speed-increasing gears*


FOR OVER 50 YEARS

*Sincerely yours* *

HAS BEEN PROUDLY INSCRIBED, IN EFFECT IF NOT IN FACT, ON THOUSANDS OF BUILDERS FLOW METERS AND CONTROLLERS!



*Superaccurate* VENTURI Pipe Line Meter

**Accurate Performance**
Super-power instrument with University Calibrated Tube

**Durable and Dependable**
Extra heavy construction, precision workmanship

**Low Maintenance**
No moving parts in the line

WITH AUTOMATIC SPECIFIC GRAVITY CORRECTION...

* BACK IN THE OLD DAYS, SECOND-RATE ROMAN SCULPTORS WHO MADE UNSIGHTLY NICKS IN THE MARBLE WOULD SECRETLY PATCH UP THE FLAWS WITH A MIXTURE OF WAX AND MARBLE DUST. THESE PATCHES WOULD DROP OUT LATER ON AND HONEST ARTISTS SUFFERED SO MUCH THAT THEY BEGAN LABELLING THEIR HANDIWORK "SINE CERA" (I. E. "WITHOUT WAX"); FROM THIS WE DERIVE OUR WORD "SINCERE" MEANING HONEST, GENUINE, REAL.

AWARDED AUG. 15, 1942

BUILDERS-PROVIDENCE, INC.

Est. 1820 • DIVISION OF BUILDERS IRON FOUNDRY • Inc. 1887

37 CODDING STREET • PROVIDENCE, R. I.

BUILDERS RECORDING-INDICATING-CONTROLLING Instruments


## Steps in Revamping Pipe Line Serving a Kansas Refinery


By WILLIAM JACK

Superintendent, Pipe Line Department
National Refining Co.

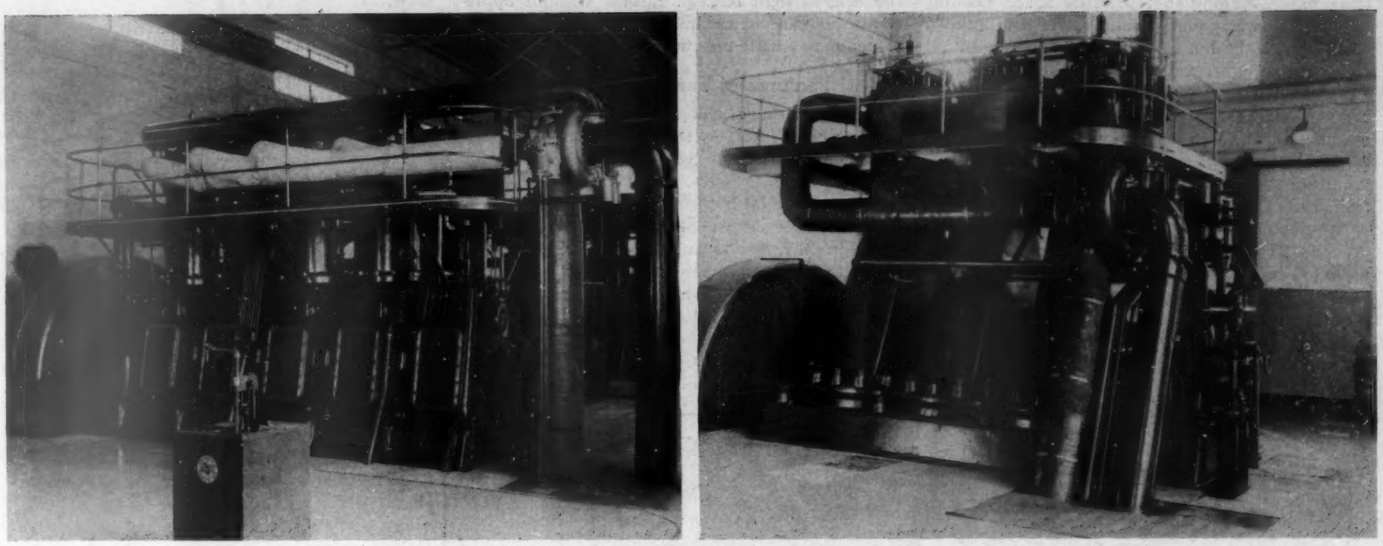

In midyear 1939 the company was confronted with the fact that its old pipe-line system—in Oklahoma and eastern Kansas, construction of which was begun in 1907 and extended from time to time—was inadequate and uneconomical to operate, particularly as we desired to operate our refinery at Coffeyville, Kans., with a high degree of flexibility. Moreover, we were confronted with salt contamination in our stream, which was running about 250 lb. NaCl to 1,000 bbl.

In order to correct this situation, we first installed salt-testing equipment at our field office and analyzed each source of supply individually, determining the amount and the solution. With the cooperation of the producer we were able to reduce this contamination to an average of 40 lb. of NaCl to 1,000 bbl.

Next, we constructed an 8-in. welded line 58 miles in length from our Hooser station, in southwestern Crowley County, Kansas, which received crude from Kansas fields and special purchases, to our Coffeyville refinery. This line has a capacity of 8,700 bbl. per day by gravity, and 18,000 bbl. per day with one centrifugal pump driven by a 250-hp. full diesel engine with a line pressure of 450 lb.

Then, in order to relieve our congested system in Oklahoma, we constructed a 6-in. welded line 8½ miles long from our Ramsey station near Copan, Okla., which receives the major supply from Washington and Osage counties in Oklahoma, north to the above-mentioned 8-in. line. A station of 13,500-bbl. capacity at 450-lb. pressure was constructed, which consisted of a centrifugal pump driven by a 180-hp. full diesel engine. The construction of these two lines made it possible to eliminate 27 miles of 6-in. line and 64 miles of 4-in. line, of which the majority was sold direct to pipe-line companies in Oklahoma. This helped to supply needs which were acute due to the shortage occasioned by the present emergency.

Cooling equipment is installed at both Ramsey and Hooser stations according to the same principles of design. As can be seen in the illustrations, heat exchangers for cooling engine jacket water are aboveground on racks where they are accessible and removed from corrosive conditions. Heat exchangers are operated to effect a drop in the temperature of the jacket water from 150° to 145° F. In summer all three exchangers are used; in winter it is only necessary to use one. Crude oil from the discharge side of the station passes outside a brass tube equipped with fins, in each exchanger. Temperature of water which cools speed-increaser gears is lowered by passing through an evaporator tower which maintains it in a range between 80° and 100° F.



*Trunk-line pump-station diesel engines of Stanolind Pipe Line Co. equipped with turbochargers*

# Turbochargers Increase Output Of Four-Cycle Diesel Engines

By I. P. STEWART
Elliott Co.

IN the wartime effort to utilize to the fullest extent all pipe-line facilities for moving shipments of crude oil and refined products northward and eastward, special attention is being given to obtaining more power reliably from existing pump-station diesel equipment. The application of turbochargers for this purpose has been sufficiently extensive to demonstrate what can be accomplished. Several methods have been devised for supercharging diesel engines, but so far as the author knows, the superchargers, which are being installed at pipe-line pump stations, are all designed according to the Buchi system which has been in general use in the United States and foreign countries for a number of years. The combined output of engines utilizing this method exceeds 2,000,000 b.hp., covering a wide range of individual ratings up to 6,000 b.hp.

Numerous types and sizes of engines of conventional design have been turbocharged with relatively few internal design changes, and with substantial increases in output. Such applications have been made with success to existing engines in the field, as well as to new engines. The practical increase in rating will vary somewhat, depending on the original design, unsupercharged rating, and service conditions. As a general rule, the power increase will be at least 35 to 40 per cent, and greater in some cases—where the engine design is particularly well suited to turbocharging.

The Buchi system can be applied to four-cycle engines for practically any service, and with few limitations as to type, size, or speed, if the engine is of more or less conventional design. Applications have been made successfully to both air and solid injection engines, as well as to low, medium, and high-speed engines. In general, the open-type combustion chamber with central injection has given the best results.

The turbocharger unit is entirely self-contained, and is connected to the engine only through the exhaust gas and air manifolds. In consists of a gas turbine driven by the gas exhausted from the power cylinders of the engine, and a centrifugal blower mounted on a common shaft, which supplies all the air required by the engine, under pressure, through the conventional air-intake manifold. The turbine utilizes a part of the energy in the exhaust gas which is otherwise wasted.

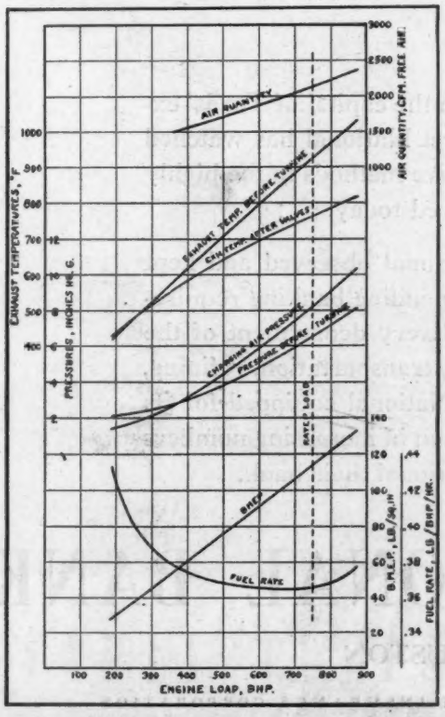



*Fig. 1—Characteristic performance of typical turbocharged engine*

The low-pressure air delivered by the turbocharger serves a dual purpose. First, it blows through the combustion space and valves, thus scavenging the residual gases otherwise left at the end of the exhaust stroke, and replaces these hot gases with cooler, fresh air. Second, it results in a cooler air charge of greater density, i.e., heavier weight, at the end of the suction stroke. The combined effect of this scavenging and pressure charging permits the combustion of a greater quantity of fuel without harmful effects to the engine, and consequently a higher output, than with a normally aspirated engine of the same displacement.

The process employs a method of creating timed pressure pulsations in the exhaust-gas manifolds. This is accomplished by the timing of inlet and exhaust valves, and proper combinations and dimensions of exhaust manifolds and turbine nozzles. The valve timing of a Buchi turbocharged engine differs essentially from that of the same engine normally aspirated, in that the exhaust valves close later and the inlet valves open earlier, thus providing a greater period of valve overlap during which both inlet and exhaust valves of the particular cylinder remain open when the piston is near top dead center.

The initial high pressure of the gas leaving each cylinder at the beginning of the exhaust stroke is transformed effectively into kinetic energy by the proper proportioning of exhaust manifolds and turbine nozzles. This energy is used to drive the turbine. After the initial surge of the exhaust gas from the cylinder, the pressure in the exhaust manifold drops nearly to atmospheric, while the air pressure from the blower remains considerably higher. The inlet valve is

then opened before the exhaust valve closes, during which period fresh compressed air blows through, scavenging the clearance space, cooling the cylinder walls, pistons, and valves, and mixing cool air with the hot exhaust gas in the manifold. After the exhaust valve closes, the inlet valve remains open to about the beginning of the compression stroke, when the cylinder is filled with relatively cool, fresh air under pressure. In order to prevent interference between the exhaust gas impulses, and to prevent blowing of exhaust gas from other cylinders during the scavenging period of a given cylinder, separate manifolds from groups of either two or three cylinders are connected to separate banks of nozzles in the turbine.

Adequate scavenging is equally as important as the pressure charging in the cylinder before compression. High density of charging air, the primary object of all supercharging methods, is achieved with the Buchi system by low temperature of the air and moderate pressure, rather than by excessive charging pressures. This gives the desired high b.m.e.p. ratings without appreciable increase of the maximum firing pressure, as compared with unsupercharged engines.

### Features of Turbocharger Use

The application of Elliott-Buchi turbochargers to existing engines offers the user a number of distinctly attractive features, among the most important being:

1. A substantial increase in output with a very small increase in weight, and generally no increase in otherwise useful space. New foundations and additional engine-room space are thus not required, as would be necessary if new engines were installed to provide the additional output.

2. The rating of engines operating at high altitudes can be increased. Sea-level rating can be restored to engines at altitudes of approximately 12,000 to 14,000 ft. At lower levels, outputs in excess of unsupercharged sea-level rating are possible.

3. When installed on an existing engine, the fuel consumption is changed very little over the original unsupercharged range of output. However, for the increased output range, the curve is very flat and the fuel consumption per brake horsepower per hour at the new turbocharged rating will be about the same or slightly less than at the original unsupercharged rating. This results in a considerable reduction in fuel consumption per brake horsepower per hour on a percentage load basis, referring to the new turbocharged rating as 100 per cent. The fuel consumption will be less at all loads with the Buchi system than with other supercharging methods.

4. Operation of the turbocharger is fully automatic at all loads, and no controls are required. Speed, air quantity, and charging pressure follow engine load and speed changes almost instantaneously, due to the low inertia of the turbocharger rotor. The engine is responsive to sudden load changes in the same manner as an unsupercharged engine. It starts easily and quickly under cold starting conditions, and during startup the turbocharger is accelerated by the starting air before the engine fires.

5. The turbocharger has no mechanical drive from the engine, being connected to it only through the air and exhaust gas manifolds. No belts, gears, or chains are required.

6. The turbocharged engine is ideally suited for direct reversing marine application, since the turbocharger always operates in the same direction regardless of engine rotation. As the turbocharger rotates from 1 to 2 minutes after shutdown of the engine, it may rotate continuously during maneuvering.

7. Experience has shown that the turbocharged engine is equally as reliable as the unsupercharged engine, and that no additional operating difficulties or maintenance costs are involved. Pistons, cylinder heads, and particularly exhaust valves, are often found to be in relatively better condition due to efficient scavenging. In spite of the increased output, it is generally possible to limit the maximum firing pressure to a very nominal increase, which may be allowed without harmful effects to the engine parts, due to smoother combustion. At the same time, such an increase has a very slight effect on the average bearing loading. Bearings designed for satisfactory unsupercharged operation have proved equally reliable after the engine was converted to Buchi turbocharging.

8. At reduced speeds down to 50 per cent or less, engine torque can be maintained constant—and in some cases actually increased—without exceeding established temperature limits.

9. Exhaust pulsations are dampened considerably in passing through the turbine. Exhaust mufflers for the turbocharged engine can, therefore, be simpler than for other types of engine. For marine application, it is generally considered entirely satisfactory to use a simple form of combination spark arrestor and muffler.

10. Relatively less heat is absorbed in the engine-jacket cooling water, since a greater percentage of heat is absorbed by the scavenging air and goes into the exhaust gas, some of which is usefully employed in the turbine. It is generally found that the heat exchanger originally installed for the unsupercharged engine will suffice for the turbocharged engine with higher rating.

Fig. 1 shows turbocharged performance of six-cylinder, 13¼-in by 17½-in. engine of conventional design, originally rated 500 b.hp. at 360 r.p.m., and increases by turbocharging to 750 b.hp. at 360 r.p.m. This type of engine is one which could be turbocharged successfully in the field with a moderate amount of modifications. Note the flatness of the fuel-consumption curve,

*(Continued on Page 118)*

"COATING AND WRAPPING" from a lithograph by E. M. Schiwetz

LOCATED in the capital of Texas' expanding oil industry, First National has watched its evolution from primitive methods to the highly efficient methods employed today.

So, too, has First National observed and kept pace with the rapidly expanding banking requirements of the industry. Every department of the oil industry—production, transportation, refining, marketing—finds First National equipped for its service. That's why oil men in increasing numbers are making the First National their bank.

FIRST NATIONAL BANK

IN HOUSTON

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

# SHRINK THREAD TOOL JOINTS

***... help conserve steel for our Nation's Armament Program by prolonging Drill Pipe Service.***

They get prolonged drill pipe service because National Shrink Thread Tool Joints eliminate last engaged thread failures—prevent leakage and washouts through pipe threads—avoid creepage during drilling and avert possibility of galled threads during application.

Also note on the opposite page how Shrink Thread permits of repeated Tool Joint replacements during the entire service life of the Drill Pipe, ***right at the well.*** No bucking-on machine required for renewal—no re-threading of pipe—no re-chasing of pipe threads and no heavy trucking expense.

***Operators who use National Shrink Thread Tool Joints will find the following suggestions most helpful in prolonging their Drill Pipe service:***

1. Great care should be used in putting a new set of tool joints into drilling service as proper running-in for the first few times will give insurance against difficulties later.

2. It is extremely important that the blocks be carefully centered above the well so that tool joints can be engaged in proper alignment.

3. Before running the tool joints in the well, the threads on both box and pin should be thoroughly cleaned with distillate, and any damage to the threads or shoulders from handling should be filed or stoned smooth.

4. Lubrication is extremely important on the tool joint threads and particularly in the initial running. Lubricants with solid additives are recommended for the lubrication of these tool joint threads. Excellent service may be secured by using special types of lubricants. An intermediate grade of lubricant is made of cup grease, tallow, and lead oxide.

5. A very successful tool joint lubricant is compounded from a steam cylinder oil base containing 4 to 6 per cent fatty oil Viscosity 120/150 Seconds Saybolt 210 degrees Fahrenheit, with the addition of curve grease, dry red lead oxide, bentonite clay, and cotton-seed meal. This product is made by several oil companies under the name of "HT-compound."

6. For the first few days of operation, it is advisable to screw the joints to the shoulder by rotating the stand of pipe in the derrick with hand tongs rather than by spinning with the rotary table or with a rope. After the shoulders contact, it is also highly important that they be thoroughly tightened by power, using a catline from the tool joint tong to the cathead on the draworks. Usually four wraps of the catline around the cathead are required to properly tong 4½" pipe and six wraps to properly tong 6⅝" pipe. It is essential that the joints remain tight throughout the drilling operation. To insure this, joints should repeatedly be inspected and any damaged condition immediately corrected, or joint removed from string. Careful supervision and joints properly tightened at all times will insure excellent service.

   Remember, there can be no wear without movement and there can be no movement if tool joints are properly shouldered.

7. Pipe should be checked periodically for straightness. Crooked pipe causes excessive tool joint wear.

## THE NATIONAL SUPPLY COMPANY

Executive Offices: Pittsburgh, Penna. • General Sales Office: Toledo, Ohio • Division Offices: Fort Worth, Texas; Tulsa, Okla.; Torrance, Calif. EXPORT: The National Supply Corporation, 30 Rockefeller Plaza, New York, N. Y., U. S. A.; River Plate House, 12 South Place, London, E. C. 2, *Limited Liability.*

*(Continued from Page 114)*

and the reasonably low exhaust temperatures.

In considering the application of a turbocharger to an engine, the first question to be decided is whether or not the power increase can be utilized effectively by the driven machine. With engines driving pumps, the load increase can sometimes be absorbed by increasing the speed, when the engine and the pump designs permit, or changing the gear ratio and increasing the pump speed only, in the case of geared units.

The successful application of the Buchi system requires careful consideration of several engineering factors which are well established from years of research and field operating experience. The problem is not so simple as merely attaching a turbocharger to an engine and piping up the exhaust gas and inlet air connections.

Because of the necessity for careful engineering, and since certain new engine parts are required when the turbocharger is installed, the customary practice is to have such an application sponsored by the original engine manufacturer. The altered valve timing requires new cams or camshafts. New exhaust manifolds, connections to the air intake manifold, a mounting bracket, expansion joints, and cooling-water connections are required in applying the turbocharger. In some cases, new fuel-pump plungers and alteration of injection timing are recommended. In other cases, new valves and slight modifications to cylinder head or piston crown are necessary.

Installation and operation of the turbocharger on the engine involve no particularly difficult problems. The turbocharger itself is a rugged and relatively simple machine. When assembled and installed properly, with care taken to prevent damage and admission of dirt while handling, reliable service can be expected with only a normal amount of operating attention. The principal requirements is an uninterrupted supply of clean lubricating oil under moderate pressure. Continuous circulation of cooling water through the turbine casing also is essential. In cases of emergency, the engine may be operated with the turbocharger inoperative, and nearly the original unsupercharged b.m.e.p. rating carried.

The turbocharger is usually supported by a bracket attached to the engine frame, with the rotor axis parallel to the crankshaft. This arrangement permits the shortest and straightest exhaust manifolds to the turbine inlet. Expansion joints are used at appropriate locations in the exhaust manifolds to the turbine, and in the exhaust pipe from the turbine, to compensate for expansion and contraction with temperature changes, and to relieve the unit of piping strains. The exhaust manifolds may be insulated in several different ways to minimize heat radiation.

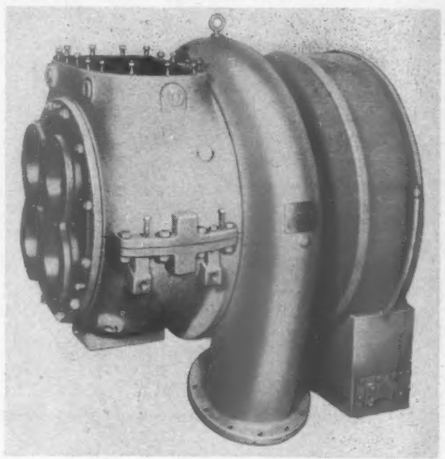


*Fig. 2—External view of completely assembled turbocharger*

Intake air to the blower is generally taken directly from the engine room, in which case a silencer is attached to the blower inlet. In other instances, air is conducted to the unit by means of piping from an external source, providing means of incorporating an intake filter in the induction system where the air contains dust, excessive oil vapors, or other impurities.

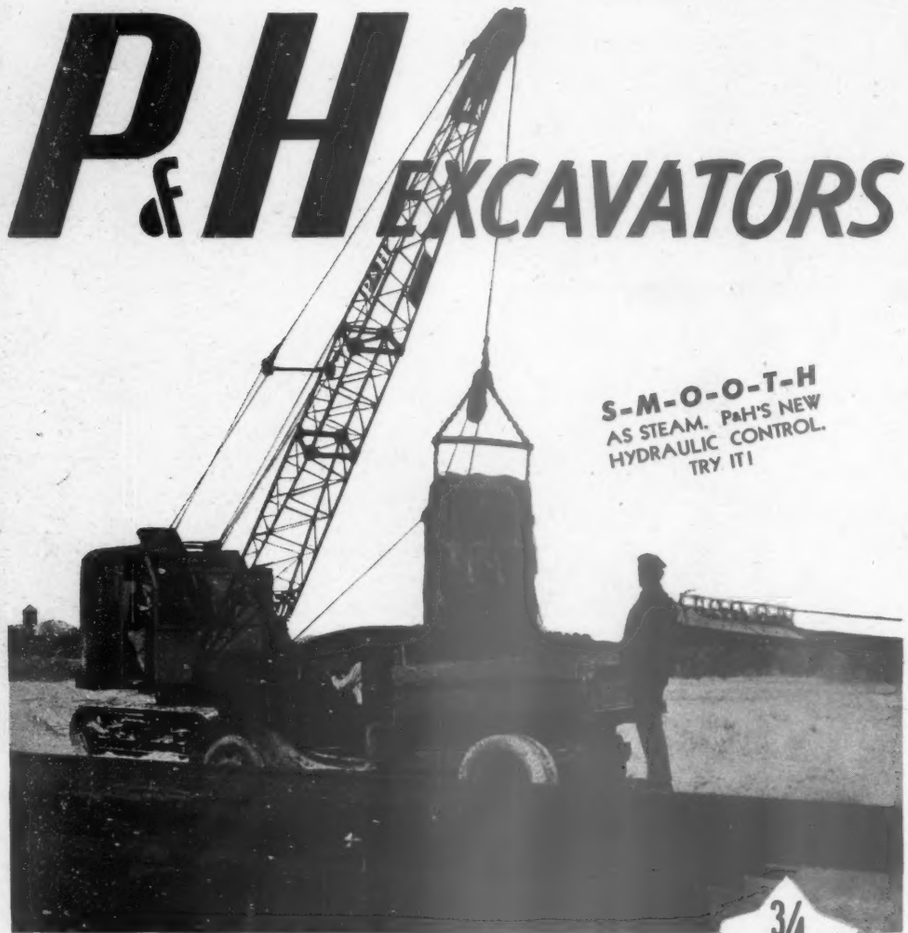
Cooling water lines to and from the turbine casing water jacket, and the lubricating-oil cooler, are connected to the engine-cooling system. Soft water cooling is recommended.

Shown is an Elliott-Buchi turbocharger installed on a four-cylinder, 16¼-in. by 24-in. engine in a pumping station of one of the major crude-oil pipe-line companies. The engine rating was increased from 450 to 675 b.hp. at 225 r.p.m. The load increase in this case was absorbed by increasing the speed of the driven oil pumps.

Several sizes of Elliott-Buchi turbochargers are standardized, and in production, which can be applied to engines with present unsupercharged ratings from about 250 b.hp. to approximately 1,100 or 1,200 b.hp. With an engine of higher rating, it is sometimes practical to install two turbochargers, one on either end.

Fig. 2 is a shop view of a completely assembled turbocharger. The turbine casing is an alloyed semisteel casting, which is water-jacketed. The turbine inlet is a steel casting containing either two, three, or four openings, depending on the number of engine cylinders. These openings are attached directly to the engine exhaust-gas manifolds through expansion joints. The nozzle ring is made of heat-resisting materials, to avoid distortion under operating temperatures. The blower casing is a high-grade iron casting and is bolted to the turbine casing. The blower casing also


P&H EXCAVATORS




DIGGING IN FOR DEFENSE

New storage tanks for oil near Houston, Texas, called for a tough digging job in heavy clay. This P&H ½-yard Dragline responded with the output that kept twenty-three trucks on the move.

That's typical of the way these P&H's go about their work on many vital projects . . . with greater strength to sustain high-speed digging. Why *greater strength?* Because no other excavator gives you rolled alloy steel construction of both upper and lower structures.

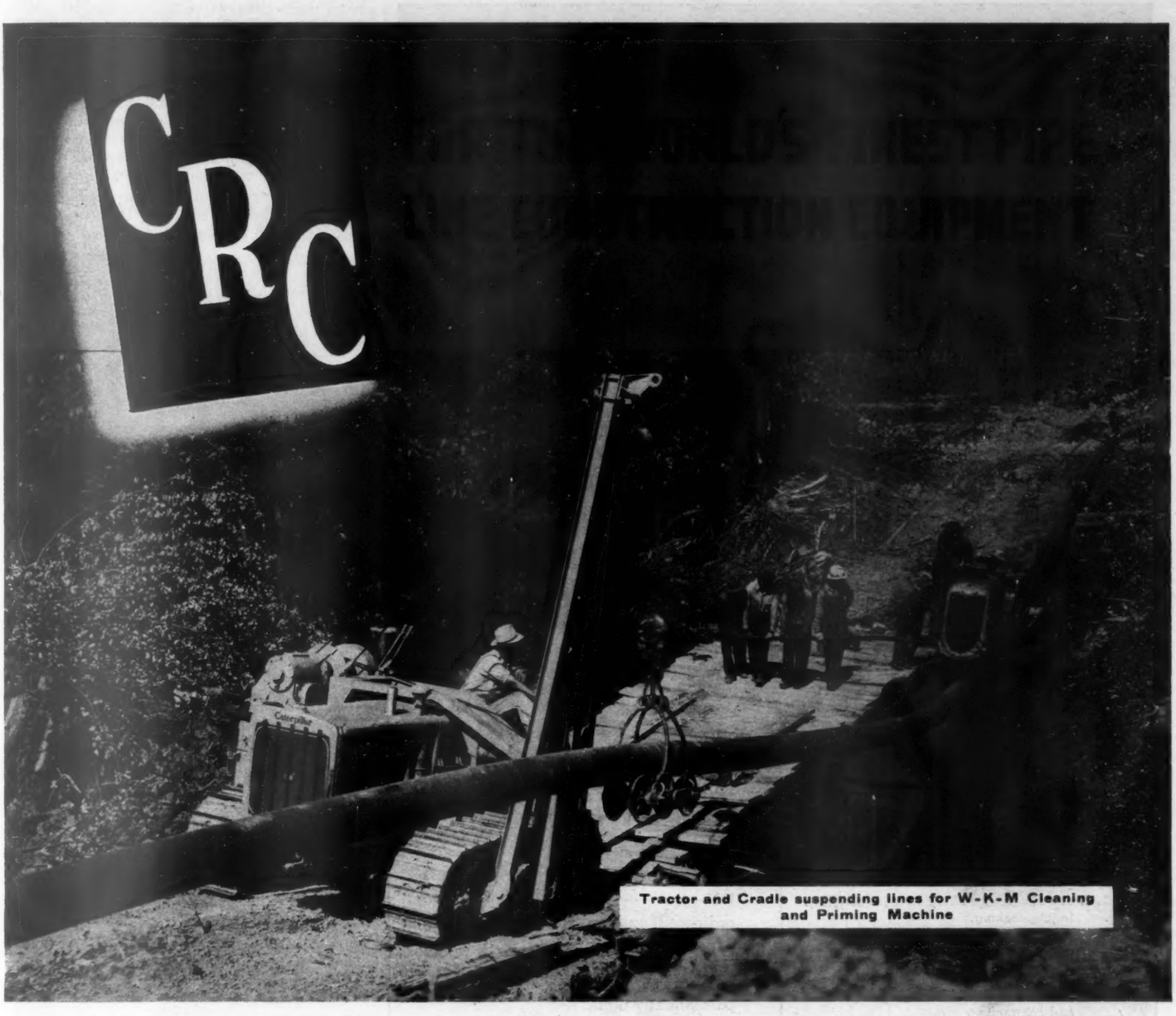
*General offices:* 4527 W. National Ave., Milwaukee, Wisconsin

3/4 YARD
1/2 YARD
3/8 YARD

*Write for literature on the size and type of P&H excavator you need.*

HARNISCHFEGER CORPORATION

EXCAVATORS • ELECTRIC CRANES • ARC WELDERS P&H HOISTS • WELDING ELECTRODES • MOTORS

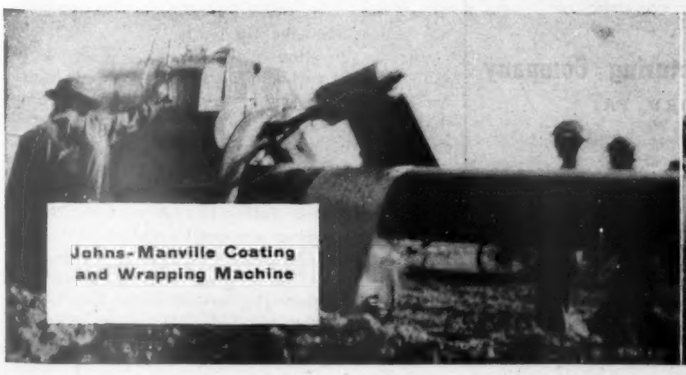



**There is no substitute for experience . . . especially in the selection of pipe line equipment. Through our manufacturing associates and our active field service on nearly all pipe line construction and reconditioning, we offer the most modern pipe line construction material and equipment.**

# Crutcher-Rolfs-Cummings

## PIPE LINE EQUIPMENT AND MATERIALS

### HOUSTON, TEXAS, U. S. A.



**Check THESE 12 PROVED ADVANTAGES THAT ONLY DRESSERS GIVE YOU**

1. Dresser Couplings eliminate all uncertainty in joint-making.
2. Dresser Couplings permit use of local, untrained labor.
3. Dresser Couplings provide the only time-proved method of absorbing expansion and contraction.
4. Dresser Couplings give greater speed.
5. Dresser Couplings simplify both pipe and joint specifications.
6. Dresser Couplings can be installed regardless of weather, wind, or rain conditions.
7. Dresser Couplings eliminate "fussy" operations.
8. Dresser Couplings permit pipe deflection for curves and grades with straight pipe.
9. Dresser Couplings reduce cost of supervision and inspection.
10. Dresser Couplings cut maintenance costs.
11. Dresser Couplings are fool-proof, strong, *permanently* tight.
12. Dresser Couplings eliminate health and fire hazards.

Speed has always been a factor in pipe-line construction. *Today*, it is more important than ever. That is why pipe-line men everywhere are turning to Dresser Couplings.

For with Dressers, pipe-joining moves forward like *clock-work*. Everything is coordinated, uniform, *standard*. Every joint is the same, regardless of wind, weather, or terrain conditions. Every joint is permanently tight.

You use local, unskilled labor. Your crews are small, compact, easily supervised, their work readily inspected. The only "machinery" needed is a wrench. Pipe can be safely joined above the ditch. No harmful lowering stresses. No bell-holes. Everything contributes to simplicity and speed. *Specify Dressers*. Save time and dollars during construction—safeguard your line after construction.

**Dresser Manufacturing Company**
**BRADFORD, PA.**

**DRESSER PIPE COUPLINGS**

*Save Labor • Save Time • Save Worry—with Dressers*


carries the cantilever-type bearing support, which supports the rotor from the blower and without the need for a water-cooled bearing at the high-temperature turbine end.

Fig. 3 shows the completely assembled rotor. The turbine disk and blades are machined all over from a high-strength, heat-resisting alloy. The blower impeller is of the closed type, and is inspected by radiograph as well as overspeeded before assembly. The complete rotor is balanced statically and dynamically to close limits.

The rotor is supported by steel-backed, babbitt-lined sleeve bearings, which are lubricated by oil under pressure. The bearing journals are superfinished. A separate self-contained lubricating system is usually furnished, in order that lubrication of the turbocharger will be independent of engine lubrication. This system includes a gear pump driven from the shaft through a reduction gear, an oil tank, oil cooler, and filter. In some installations, lubrication is being provided successfully from the engine pressure-lubricating system, in which case a separate twin filter element is furnished for the turbocharger oil supply.

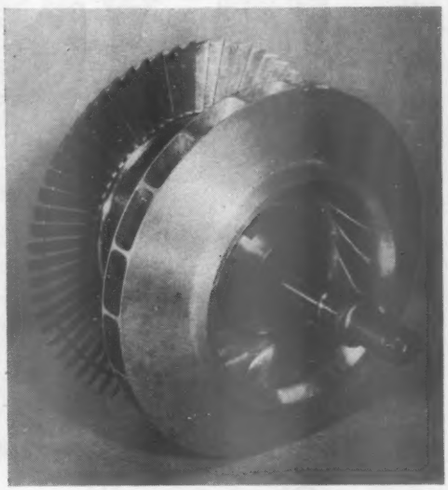


*Fig. 3—Turbocharger rotor looking into the inlet of the blower impeller*

Some readers undoubtedly will be curious about the cost of making such an installation on an existing engine. Due to the many variable factors involved, it is not possible to give a precise figure until all of the factors are known, and it will be found that the cost will vary somewhat, depending on individual circumstances. However, a rather liberal estimate would be approximately $30 to $40 per horsepower *increase* in output, including the engineering cost, turbocharger, manifolds, new engine parts, and installation on the first engine. Repeat applications on identical engines would result in reduced unit cost, since certain elements making up the total cost of the first installation would be reduced or eliminated. (It should be noted that the cost of turbocharger installations on new engines is very materially less than the above figures.)

Another question the prospective user might ask is "Can turbochargers be procured under present war-production requirements, assuming that it will help my particular problem?" The answer to this question is simply the same as for other critical machinery being used in the war effort—you can obtain delivery of turbochargers if your preference rating is high enough. These machines are being produced regularly in quantities for the Army, Navy, and other governmental agencies. Therefore, if your problem is of sufficient importance to warrant a high priority, turbochargers can be delivered usually in less time than it would take to secure new engines.

# Developments in Maintaining Compressor-Station Equipment

By W. E. NESTOR* and G. H. McKAY†

DEMANDS on manufacturers of gas-compressing equipment, steel-pipe mills, foundries, etc., under war conditions are making it increasingly difficult to obtain replacement parts and other material necessary to maintain equipment and pipe lines in a high state of efficiency to meet the abnormal demands on natural-gas systems to supply gas to the ever-increasing number of wartime industries as well as their regular domestic and industrial customers.

Critical metals, such as tin, aluminum, tungsten, bronze, nickel and copper, much of which is used in the natural-gas industry, cannot now be obtained without a very high priority rating, and then only if its use is conducive in some way to the war effort.

Engineers of the compressor-station department, realizing the difficulties arising from the scarcity of these critical metals, are making every effort to conserve their use in the making of repairs by substituting other metals where practical or metalizing present parts made of bronze or brass heretofore discarded as worn out.

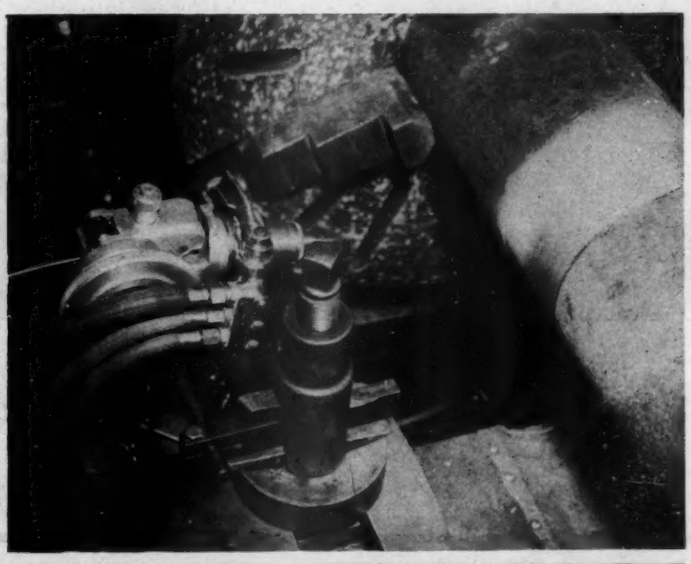
Numerous parts such as water service telescopic plungers, exhaust and inlet valves, arm bushing piston rods, piston-ring grooves, crosshead pins, exhaust and inlet fulcrum pins are all built up by the metalizing process or by use of the electric arc and restored to standard size by machining.

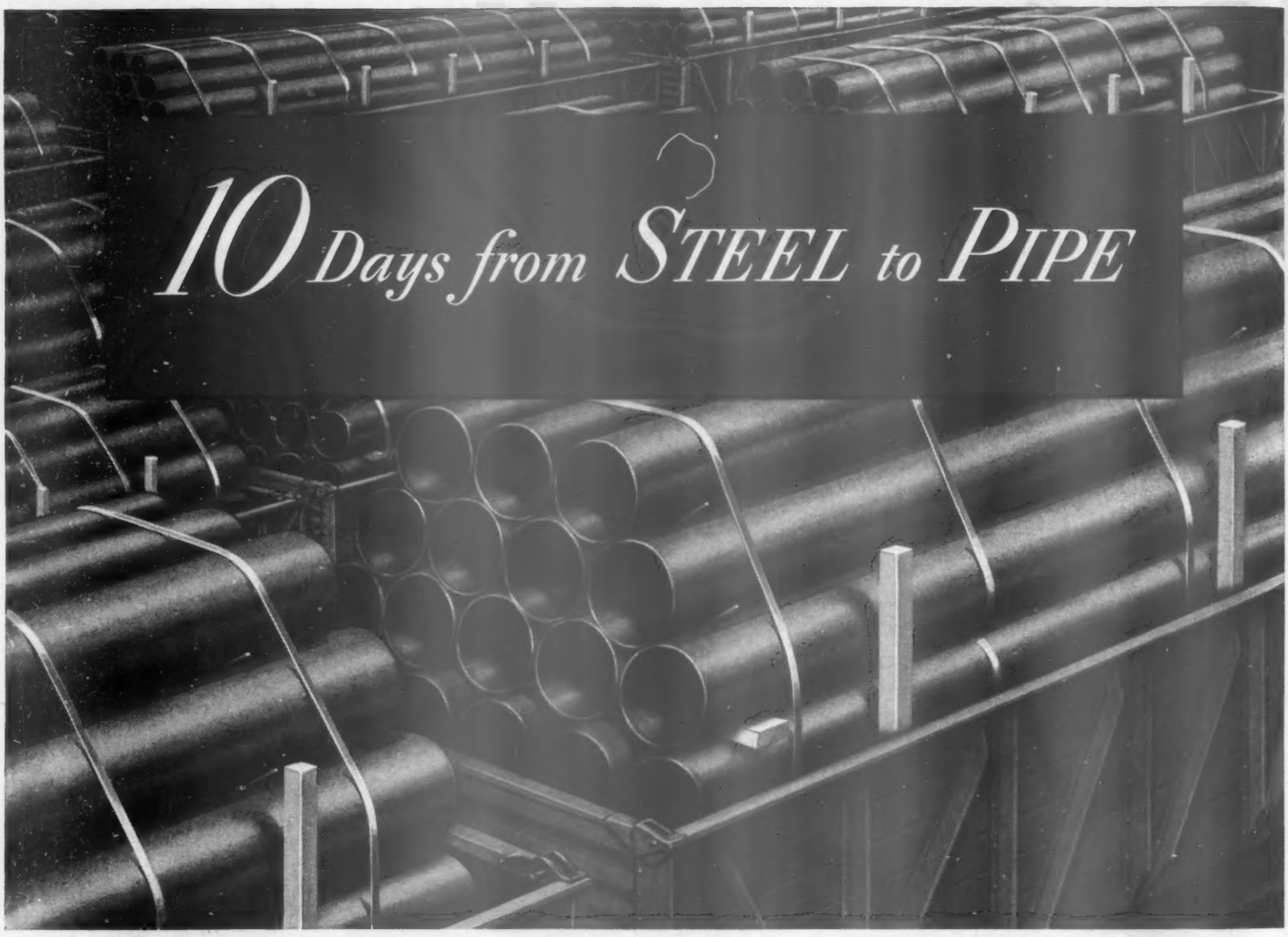
One of the major repair jobs on large twin-tandem gas-compressor units is in the replacement of power pistons. When side wear in ring grooves makes the use of too wide an oversize ring impractical, it becomes necessary to remove the piston from the rod and replace it with a new one and while these pistons are pressed on at a normal pressed fit in the factory, corrosion action from cooling water used to cool the piston and rod makes their removal a job for a very powerful hydraulic press.

Very few compressor stations are located near a city or large town where facilities for handling such large work can be found, which of course

*Superintendent, compressor stations, Arkansas Louisiana Gas Co.
†WPB, power branch, Washington, D. C. Formerly engineer, Arkansas Louisiana Gas Co.

*Under wartime conditions equipment for maintaining compressor-station equipment assumes greater importance. Upper left: Operation for grinding rods of compressor unit. Upper right: Metal-spraying equipment in service. Lower left: Indicator system for engine of compressor unit. Lower right: Pneumatic starter for engine*






# Smith Line Pipe Saves Time and Steel

Ten days from the time steel reaches the plant—line pipe starts rolling to the job.

Speed of manufacture and lighter weight in Smith Line Pipe are accomplished by the exclusive Smith manufacturing process without any sacrifice of safety. Each length of Smith Line Pipe must pass a test of from two to three times normal working pressure during manufacture.

Results . . . less steel . . . lower cost . . . and better line pipe—delivered on time.

ELECTRIC-WELDED SMITH WAY LINE PIPE

*Oil Well Casing and Supplies*
*Line Pipe*
*Alloy Lined Pipe*
*Pressure Vessels*
*Alloy Lined Vessels*
*Electrodes and Welding Equipment*
*Smith Meters for tank trucks, pipe lines, and refineries*

## A. O. SMITH Corporation

MILWAUKEE • WISCONSIN

necessitates a long haul to and from a machine shop to have these pistons removed from the rod and replaced with new ones.

To eliminate this hauling expense and to facilitate the quick removal and reassembly of power and other piston rods, the compressor-station department engineers designed a special 200-ton power-driven hydraulic press and fabricated it entirely in the compressor-station machine shop by the regular shop and station employes. This was done at a very low cost compared to a factory-made press.

Usually pistons break loose at from 130 to 150-ton pressure, but due to excessive corrosion one piston required 190 tons to break it loose. In addition to pressing pistons off and on the rods, this press has many other uses such as straightening power and compressor piston rods, pressing in bushings, holding pipe for bending, etc.

Since nearly all the various natural-gas companies operating in this territory use the open raw-water system for cooling their engines, corrosion in the interior of power piston rods is a serious problem.

Usually excessive corrosion occurs at the dividing partition in the center of the rod due in part to the sloshing action of the water from reciprocation of the rod.

When power rods are found corroded to an extent not too seriously to impair the strength of the rod, further corrosion is retarded by pouring a special lead, with slightly expanding qualities after cooling, into the corroded space and the water parts drilled through the lead for circulation.

Engineers from one of the other gas companies in making a study of the piston-rod corrosion problem have found that excessive corrosion in power piston rods is caused in some degree by escaped air, from the piston-rod water-service air chamber, becoming entrapped in the piston and rod.

As a possible solution to this problem, they have tapped the air chamber and replaced the air cushion with natural gas. This practice has also been adopted on our compressor stations. Another advantage in having a means of putting gas in the chamber is to add additional gas for cushioning when water hammer occurs in the rod.

Recently a repair job of considerable interest was performed in the truing up of the crank pins on the 1,300-hp. Snow gas engines.

These engines have been in service for 31 years and while the large crank pins measuring 11 in. by 11 in. are flooded by a constant stream of lubricating oil, the heavy shock and high bearing pressure they have been constantly subjected to over so long a period of time caused them to wear oblong at the points on the pin that receives the thrust from the piston impulse, which is transferred to the crank pin through the piston rod, crosshead and connecting rod.

A special crank-pin turning machine is clamped to the faced surface of the crank-pin counter balance and the center in spindle of the machine centered in the crank-pin center thus bringing the machine in alignment for turning.

A ring gear traveling in an enclosed housing carries the tool bits for cutting. It is driven by a small pinion feather keyed to a drive shaft which is supported by both the ring-gear housing and a bracket bolted to the outer end of the bed of the machine. An air drill attached to the taper shank on the drive shaft furnishes power to drive the machine.

Feed for the tool bits is supplied by a lead screw running through the base of the machine and attached to a lead unit cast on the bottom of the traveling head. A stud gear driven by a pinion from the drive shaft and to which an adjustable crank arm is bolted automatically operates the feed through a ratch attached to the lead screw.

An efficient ignition system means smooth running and fuel economy. All the compressor units purchased by our company prior to 1920 were factory-equipped with make-and-break ignition systems, none of which had any means of simultaneously advancing or retarding the ignition on the eight points of twin-tandem double-acting engines or the four points in the case of a single-tandem double-acting engine.

Because of this condition speed range on these old gas engines was limited to approximately 10 r.p.m.

To obtain a wider range of speed and effect greater fuel economy and quieter operation, the old make-and-break ignition system was discarded and the engines equipped with modern jump-spark systems.

The simplicity and reliability of this ignition system as well as the extremely low cost of installation, together with the assurance of securing replacement parts, make it an ideal changeover when critical materials used in the old make-and-break system are so difficult to obtain during this wartime period.

The changeover from make-and-break ignition to the jump-spark system resulted in an increase in speed range from 10 r.p.m. to 30 r.p.m., quieter running and a considerable saving in fuel.

Other troublesome kinks worked out by our compressor-station engineers were in the redesigning of compressor valves and exhaust valves.

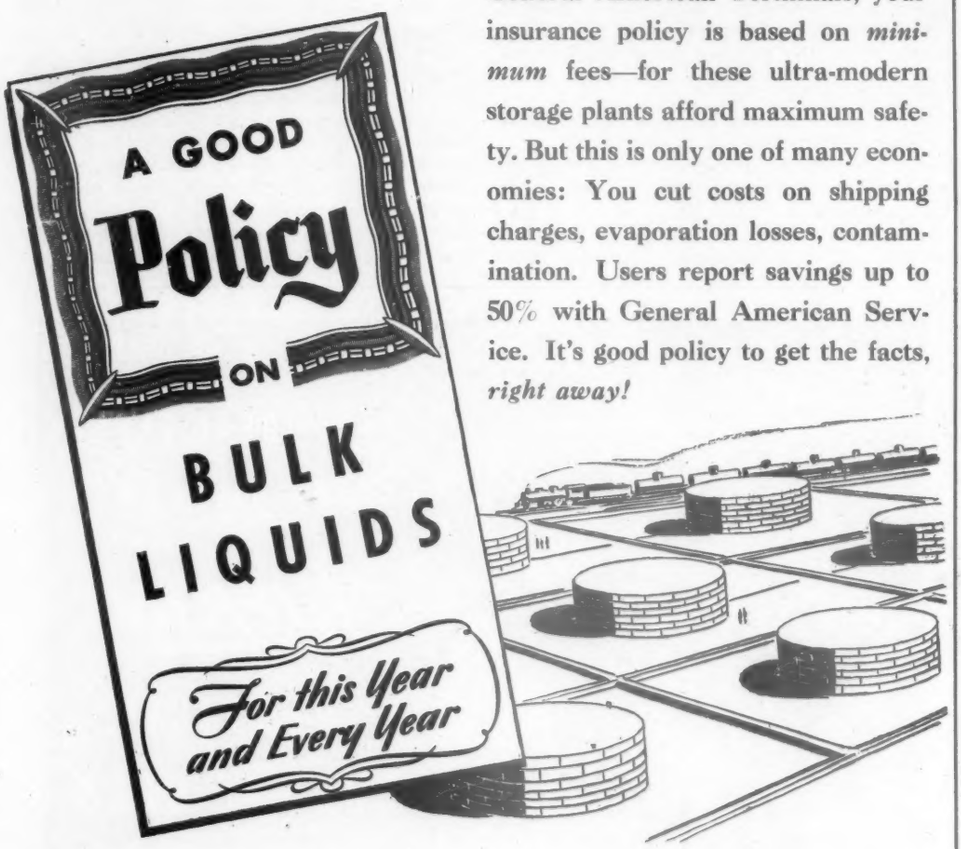
Cup-type valves were replaced with the lighter and more efficient disk-type valves in the compressors, resulting in higher volumetric efficiency, greater operation and the elimination of frequent shutdowns for repairs.

Exhaust valves on our engines are water cooled. Hollow tubing screwed into the exhaust valve

THE IDEAL TAPE
FOR OIL MEN
LUFKIN
"DERRICK"
CHROME CLAD
STEEL TAPE
LUFKIN
DERRICK CHROME CLAD
EASY TO READ MARKINGS THAT ARE DURABLE
the ideal tape for oilmen working
on a derrick. It's easy to read. Jet black
markings show up prominently against a
satin chrome surface that won't rust,
crack, chip or peel. The narrow (¼") line
reduces wind resistance. The large end
ring and hook permit rapid, accurate
measuring of casing standing upright in
a derrick.
The long, one-piece winding handle can
be turned over to lock the tape at any
point. Write for free catalog today.
BUY THROUGH YOUR SUPPLY HOUSE
LUFKIN
SAGINAW, MICHIGAN · NEW YORK CITY
TAPES · RULES · PRECISION TOOLS

# What's Your Policy on Bulk Liquids?

When you store bulk liquids at General American Terminals, your insurance policy is based on *minimum* fees—for these ultra-modern storage plants afford maximum safety. But this is only one of many economies: You cut costs on shipping charges, evaporation losses, contamination. Users report savings up to 50% with General American Service. It's good policy to get the facts, *right away!*




## ONLY GENERAL AMERICAN GIVES ALL THESE ADVANTAGES:

**KEEP 'EM ROLLING!**

Freight cars—particularly tank cars—are vital to Victory. They must be loaded, unloaded, kept moving with all possible speed. Delays may cost lives!

1. *RELIABLE CUSTODIANSHIP.* Our warehouse receipts are highest type of collateral everywhere.
2. *MODERN PROTECTION.* Latest safety appliances; lowest insurance rates, minimum evaporation losses.
3. *INDEPENDENT OWNERSHIP.* Strictest privacy. We do not buy, sell or refine any oils.
4. *NO WHARFAGE.* There is no wharfage at our own private docks.
5. *SPEED WITH SAFETY.* Day and night crews, complete facilities, eliminate all shipping delays.
6. *LARGE TANK CAR FLEET.* Now working night and day, delivering essentials of war.
7. *NO CONTAMINATION.* Separate pumps, lines, storage zones for dissimilar commodities.

GATX GENERAL AMERICAN

**GENERAL AMERICAN TANK STORAGE TERMINALS**

GOODHOPE and WESTWEGO, LA. (Port of New Orleans)
CARTERET, NEW JERSEY (Port of New York)
CORPUS CHRISTI, TEXAS GALENA PARK, TEXAS (Port of Houston)

**A DIVISION OF GENERAL AMERICAN TRANSPORTATION CORP.**


head serves as the exhaust valve stem. Formerly a ½-in. brass tube attached to a thimble at the bottom of the stem and extending to within ½ in. of the inner surface of the top of the valve head served to supply cooling water to the valve, the return being effected by flowing between the inner surface of the valve-stem walls and the outer surface of the water-supply pipe. Hose attached to the thimble at the hollow of the exhaust valve stem served to supply the cooling water and return the water after cooling to the drain funnels.

To eliminate the hot-water return hose on which operators frequently received scald burns while changing them, a new valve was designed with a hose 3 in. long cast on the under side of the valve head. A ½-in. port was drilled through this hose into the exhaust-head water chamber to allow cooling water to discharge directly into the exhaust pipe after cooling the valve.

Another wrinkle worked out by our compressor-station engineers to eliminate the tedious and back-breaking job of barring over the large flywheels while making major repairs was in the design of a pneumatic jack to perform this job. A cast-iron cylinder bored and ground to a mirror finish is fitted with a piston rod to which at one end is attached a close-fitting leather cup to act as a piston while the other end is machined to a rectangle to fit the slots in the flywheel rim and bent to an angle of 30° to compensate for angularity.

The cylinder is machined at the bottom and drilled for a 1¾-in. fulcrum pin. At the rear of each flywheel a fulcrum stand is bolted to the floor at a suitable distance to serve the cylinder, thus the one cylinder can be used as needed on any of the engines.

Air is supplied by a three-way cock attached to a port drilled in the bottom of the cylinder and release of the air after full stroke is reached is through this valve.

To prevent over travel and damage to the cylinder head emergency relief ports are drilled into the cylinder to automatically release the air when full travel is reached.

Frequent use of the indicator on both the power engines and compressors is a regular practice on our plants. However, while some of the older engines were factory equipped with indicator motions, no provision was made for a compressor indicator motion. To supply this need, a home-made motion was applied by bolting a ⅜-in. steel plate approximately 4½ ft. long to the compressor push rod. The outer edge of this plate is taped 0.375 to the inch to give motion to a bell crank mounted on the main frame to which one end is attached a swivel carrying a bakelite shoe for contact with the tapered plate, the other end having a knot for attachment of the indicator cord to another knot mounted on the bell crank is attached a tension spring the other end of which is fastened to a post mounted on the top of the main frame. This spring seems to hold the bakelite shoe in contact with the taper plate while indicating the compressors.

Still another wrinkle ironed out was the making and installation of a very simple dash pot attached to the mixing valve rod to prevent racing of vertical auxiliary engines while operating on light leads.

Scarcity of critical metals and the delay in securing the high priorities necessary to obtain them require the use of substituting where possible and the reconditioning of worn engine and compressor parts by use of the electric arc and metalizing methods.

Power and compressor piston rods, wrist pins, exhaust valve stems, inlet and exhaust valve lever arm pins, worn piston ring grooves and many smaller parts that were formerly discarded as worn out, are now built up by arc welding or metalizing and restored to standard size by machining and grinding.

# Several Changes in California Lines Expedite War Operations

CONVERSION of the Stanpac natural-gas pipe line from gas to crude oil officially announced early in the year, was the most important pipe-line development in California. This 22-in. pipe line, extending northward from the Ketleman North Dome field in Kings and Fresno counties to Richmond in the San Franscico Bay region, was laid several years ago to move natural gas from San Joaquin Valley fields to the centers of population in the central part of the state. With the advent of present hostilities, it was deemed dangerous to continue loading operations at Estero Bay where tankers anchor out in the open ocean and load crude oil by means of a submarine pipe line, so the pipe-line committee of District 5, headed by Charles S. Jones, president of Richfield Oil Corp., conducted a careful survey of pipe-line facilities out of which came a plan for the use of existing pipe lines and conversion of the Stanpac line to crude-oil use.

In order to conserve critical materials and to save valuable time, it was decided to move only the lighter-gravity oil through the Stanpac line and to move the heavier grades of crude oil through the two lines of Shell and that of Tide Water Associated Oil Co. By using only the lightest-gravity crude oils produced in the San Joaquin Valley, it was not necessary to build any additional pump stations along the entire 225-mile route. Shell Oil Co. and Tide Water Associated Oil Co. increased pressures along their respective pipe lines which increased capacity and the plan has been working as originally contemplated.

### Greater Reliability Secured

Standard Oil Co. of California tore up its San Joaquin Valley pipe-line system several years ago when it built westward to Estero Bay as it was found cheaper to transport crude oil to tidewater at Estero and move it in by tankers from that point. Standard also secured greater flexibility as it was possible, too, to move southward to Los Angeles Harbor or El Segundo by tanker. That part of the San Joaquin Valley pipe line southward from Richmond to Pittsburg was not torn up as Standard makes substantial deliveries of fuel oil to the Southern Pacific Co. at Pittsburg and Los Mendanos. This fuel oil is pumped southward from the company's Richmond refinery. This pipe line was important because it enabled the company to tie in the converted Stanpac gas line with the original segment of the old San Joaquin Valley pipe-line system. This left the portion of the original Stanpac gas line west of Los Mendanos available for other use and accordingly this segment was connected by a new short line with the Rio Vista gas field and other existing pipe-line facilities.

To make up for the smaller amount of gas that will be moved northward from San Joaquin Valley fields, the several gas fields in and around the delta region will produce at a greater rate. Rio Vista gas field in particular is expected to substantially increase gas production during the winter period of peak demand and to provide sufficient natural gas to meet all normal requirements. The Stanpac gas line has been moving crude oil northward for the past several months and the gas fields in the delta region have already started to take over the gas load.

The Stanpac pipe line is moving approximately 100,000 bbl. of crude oil per day at low pressure and it is believed that the line's capacity could be stepped up to 150,000 bbl. by the addition of two pump stations. The conversion of this gas line required maximum cooperation on the part of all involved. The line is owned jointly by Standard Oil Co. of California and Pacific Gas & Electric Co., and consequently when this conversion was under consideration the latter company voluntarily released its share in the line. In addition, permission had to be secured from the state Railroad Commission which has jurisdiction of California public utilities. Once the program was agreed upon it was quickly carried out.

The present Stanpac crude-oil line is the largest-diameter pipe line in operation and will be surpassed only by the so-called "Big Inch" line now being laid northward out of the Gulf Coast area. Standard Oil Co. of California, Tide Water Asso-

Get your
VACUUM
the modern
way—
—simply and economically, with Elliott Steam Jet Ejectors. No moving parts, very low maintenance, no trouble. Tell us your vacuum needs and conditions.
ELLIOTT COMPANY
Heat Transfer Dept., JEANNETTE, PA.
DISTRICT OFFICES IN PRINCIPAL CITIES
G-375
ELLIOTT
VACUUM PRODUCING EQUIPMENT FOR REFINERIES

ciated Oil Co., Shell Oil Co. and Union Oil Co., which maintain refineries in the San Francisco Bay region, are all drawing part of their requirements from the Stanpac line and the several other smaller pipe lines serving the district.

Standard Oil Co. discovered a new commercial gas field on Roberts Island in the delta region during August and is expected to finish the discovery well in a new probable commercial gas field at the extreme eastern end of Suisun Bay at an early date. These new areas will be connected up with pipe-line facilities soon and they should assist in meeting any abnormal demand for natural gas during the winter period. The natural-gas lines connecting up the Stanpac segment west of Pittsburg and Los Mendanos were relatively short and did not represent a major undertaking. Union Oil Co., due to decreased production of natural gas, converted its Santa Maria Valley gas line to crude-oil use but this unit was relatively short and of comparatively small diameter.

### Little New Construction

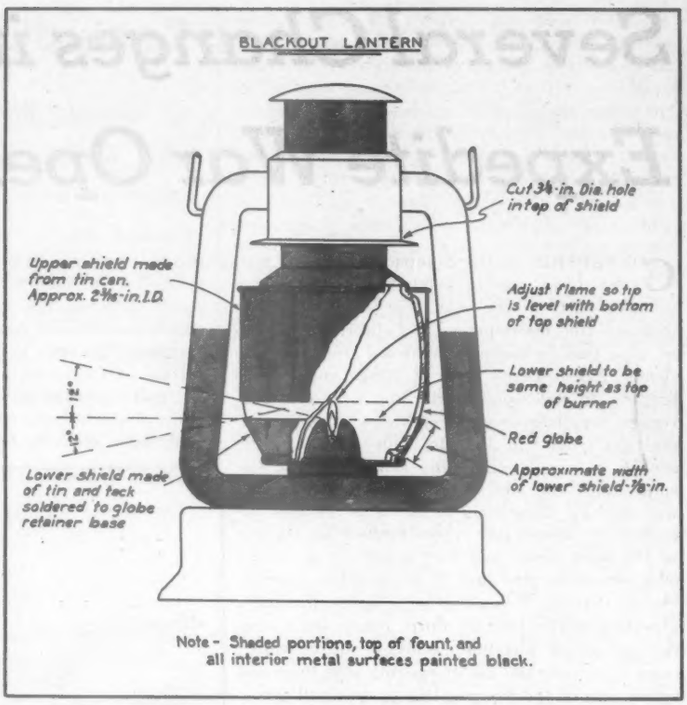
While there has been little new construction work in California during the past year, considerable time and effort have been spent in maintenance work. Due to the speedup of pipe-line systems and in order to maintain throughput rates, it has become necessary to thoroughly organize maintenance and operations.

Systematic methods of test holing and making line current and soil-resistivity surveys have been in operation for several months to forecast corrosion troubles and make necessary repairs and treat or re-treat before any replacement of steel is required. Patches, half soles, clamps, couplings, tools and other necessary material are maintained at strategic points to minimize the time required to repair a leak or break. This is of prime importance not only during normal operations but also in the handling of repair work necessitated by bombing or sabotage.

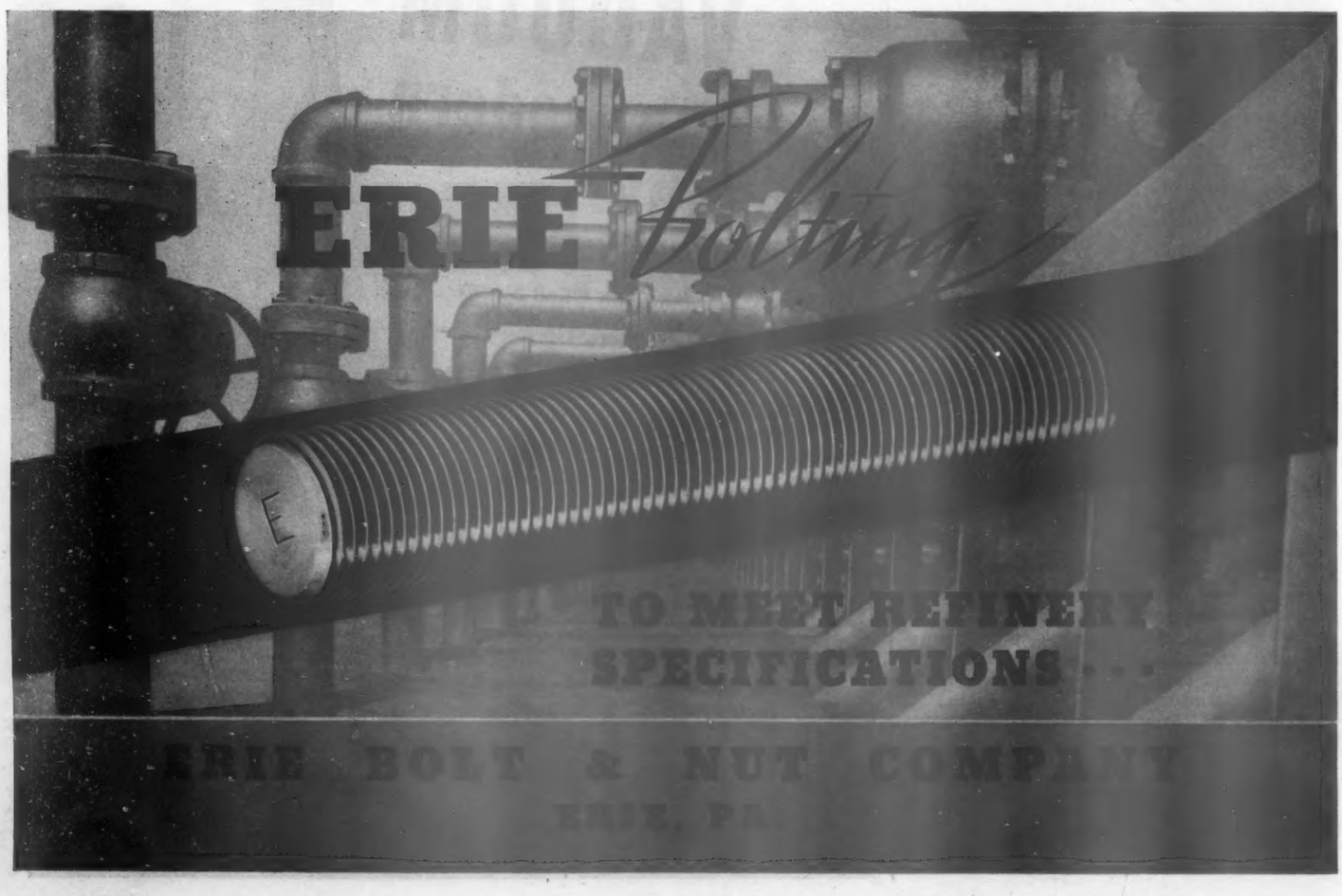
All pump-station facilities, including pumps, boilers, and auxiliaries are continuously inspected and minor adjustments and repairs made. Due to limited drilling activity, 150-hp. high-pressure drilling boilers and feed-water pumps have been utilized to aid in carrying increased loads at pump stations, thus obtaining maximum rates without purchase of new equipment. The surplus of oil-field boilers, due to restricted drilling, has enabled pipe-line companies to install one boiler at each pump station. These standby boilers are placed outside the main pump station and are only used in case of necessity. Pipe-line pressures have been substantially increased, pump speeds stepped up, and standby equipment placed in operation.

In addition to placing additional burdens on pipe-line companies, the war has forced the general adoption of centralized control and standardized practices by all California pipe-line companies as a safety measure. This control extends to pipe lines, refineries, natural-gasoline plants and tank farms and is very effective. A separate communication system has been created and all possible subjects of attack are notified immediately upon receipt of the danger signal and ordered to take precautionary measures and be

*(Continued on Page 177)*


BLACKOUT LANTERN
Cut 3/4-in. Dia. hole in top of shield
Upper shield made from tin can. Approx. 2 1/8-in. I.D.
Adjust flame so tip is level with bottom of top shield
Lower shield to be same height as top of burner
Red globe
Approximate width of lower shield-7/8-in.
Lower shield made of tin and teck soldered to globe retainer base
Note - Shaded portions, top of fount, and all interior metal surfaces painted black.

***Blackout lantern designed for use on excavations during full blackouts, and adopted as standard equipment by pipe-line companies moving oil, gas, and gasoline***



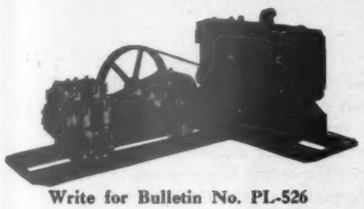
# WHEATLEY PUMPS

**The Most Complete and Advanced Line of Double-Acting, Reciprocating, Power-Driven Pumps**

## DUPLEX • TRIPLEX • QUINTUPLEX

*Originator of Double Suction Pot-type Fluid Cylinders*

## EXCLUSIVE: A 6" x 6" with 10" Stroke Capacity



Write for Bulletin No. PL-526

Though this pump normally is guaranteed for a 25 H.P. load, many have been sold to accept 50 H.P. and the results have been more than satisfactory. Please check this chart with those of competitive pumps, and discover that there is no comparison.

**By running this pump 100 RPM which is 30 RPM in excess of normal 6" x 6" operations, we can produce capacities and pressures shown on the chart below. The additional RPM increases this pump's output to the equal of a 5" x 10" without working undue hardship on the pump. Saves money, space and transportation difficulties. Lighter in weight. Easier to handle. Greater service per dollar invested.**

| Size | Barrels Per Day | Barrels Per Hour | R. P. M. | Working Pressure | H.P. Required |
|---|---|---|---|---|---|
| 3x6 | 2,365 | 99 | 100 | 780 | 37.0 |
| 3½x6 | 3,222 | 135 | 100 | 575 | 37.1 |
| 4x6 | 4,320 | 180 | 100 | 440 | 38.0 |
| 4½x6 | 5,486 | 228 | 100 | 340 | 37.2 |
| 5x6 | 6,822 | 284 | 100 | 275 | 37.6 |
| 5½x6 | 8,297 | 345 | 100 | 225 | 37.4 |
| 6x6 | 9,874 | 412 | 100 | 190 | 37.6 |

### WHEATLEY FEATURES
THAT SPEAK FOR THEMSELVES

- Totally Enclosed
- Herringbone Gears
- Timken & Hyatt Bearings
- Pot-Type Fluid Cylinders
- Flood Lubrication in crankcase
- Reducing Liners
- Double Suction Fluid Cylinders
- Larger Valve Areas
- Built-in Suction Strainers
- Greater Capacities
- More Pressure
- Faster Speeds
- Equipped for Any Service

## THE WHEATLEY PUMP LINE

| Figure | Liner | Gals. Per Min. | Bbls. Per Hour | Pressure Per Square Inch | Max. H.P Req'd |
|---|---|---|---|---|---|
| 4"x6"—Direct Drive<br>Fig. 1324<br>Duplex<br>70 R.P.M. | 2½" | 32 | 46 | 1120* | 25 |
| | 2¾" | 39 | 56 | 926 | 25 |
| | 3" | 48 | 68 | 767 | 25 |
| | 3½" | 66 | 95 | 550 | 25 |
| | 4" | 88 | 125 | 417 | 25 |
| 4"x6"—V-Belt Drive<br>Fig. 1024<br>Duplex<br>70 R.P.M. | 2½" | 32 | 46 | 1120* | 25 |
| | 2¾" | 39 | 56 | 926 | 25 |
| | 3" | 48 | 68 | 767 | 25 |
| | 3½" | 66 | 95 | 550 | 25 |
| | 4" | 88 | 125 | 417 | 25 |
| 6"x6"—Direct Drive<br>Fig. 1336<br>Duplex<br>70 R.P.M. | 3" | 48 | 68 | 767 | 25 |
| | 3½" | 66 | 95 | 550 | 25 |
| | 4" | 88 | 125 | 417 | 25 |
| | 4½" | 112 | 160 | 325 | 25 |
| | 5" | 139 | 199 | 262 | 25 |
| | 5½" | 169 | 242 | 216 | 25 |
| | 6" | 202 | 288 | 181 | 25 |
| 6"x6"—V-Belt Drive<br>Fig. 1036<br>Duplex<br>70 R.P.M. | 3" | 48 | 68 | 767 | 25 |
| | 3½" | 66 | 95 | 550 | 25 |
| | 4" | 88 | 125 | 417 | 25 |
| | 4½" | 112 | 160 | 325 | 25 |
| | 5" | 139 | 199 | 262 | 25 |
| | 5½" | 169 | 242 | 216 | 25 |
| | 6" | 202 | 288 | 181 | 25 |
| 5"x10"—Direct Drive<br>Fig. 1550<br>Duplex<br>60 R.P.M. | 2½" | 41 | 59 | 1325* | 38 |
| | 3" | 64 | 92 | 920 | 40 |
| | 3½" | 91 | 130 | 675 | 41 |
| | 4" | 122 | 173 | 517 | 43 |
| | 4½" | 156 | 223 | 408 | 43 |
| | 5" | 194 | 278 | 330 | 44 |
| 7"x10"—Direct Drive<br>Fig. 1570<br>Duplex<br>60 R.P.M. | 3" | 64 | 92 | 920 | 40 |
| | 3½" | 91 | 130 | 675 | 41 |
| | 4" | 122 | 173 | 517 | 43 |
| | 4½" | 156 | 223 | 408 | 43 |
| | 5" | 194 | 278 | 330 | 44 |
| | 5½" | 238 | 340 | 274 | 45 |
| | 6" | 284 | 407 | 230 | 45 |
| | 6½" | 336 | 480 | 195 | 45 |
| | 7" | 390 | 557 | 168 | 45 |
| 5"x10"—V-Belt Drive<br>Fig. 2050<br>Duplex<br>60 R.P.M. | 2½" | 41 | 59 | 1400* | 40 |
| | 3" | 64 | 92 | 1203* | 53 |
| | 3½" | 91 | 130 | 865 | 54 |
| | 4" | 122 | 173 | 650 | 54 |
| | 4½" | 156 | 223 | 505 | 54 |
| | 5" | 194 | 278 | 405 | 54 |
| 7"x10"—V-Belt Drive<br>Fig. 2070<br>Duplex<br>60 R.P.M. | 3" | 64 | 92 | 1203* | 53 |
| | 3½" | 91 | 130 | 865 | 54 |
| | 4" | 122 | 173 | 650 | 54 |
| | 4½" | 156 | 223 | 505 | 54 |
| | 5" | 194 | 278 | 405 | 54 |
| | 5½" | 238 | 340 | 331 | 54 |
| | 6" | 284 | 407 | 278 | 54 |
| | 6½" | 336 | 480 | 235 | 54 |
| | 7" | 390 | 557 | 202 | 54 |
| 7"x10"—V-Belt Drive<br>Fig. 2170<br>Duplex<br>60 R.P.M. | 3" | 64 | 92 | 1400* | 62 |
| | 3½" | 91 | 130 | 1296* | 81 |
| | 4" | 122 | 173 | 975 | 81 |
| | 4½" | 156 | 223 | 757 | 81 |
| | 5" | 194 | 278 | 607 | 81 |
| | 5½" | 238 | 340 | 496 | 81 |
| | 6" | 284 | 407 | 415 | 81 |
| | 6½" | 335 | 480 | 352 | 81 |
| | 7" | 390 | 557 | 303 | 81 |
| 8"x10"—V-Belt Drive<br>Fig. 2180<br>Duplex<br>60 R.P.M. | 3" | 64 | 92 | 1400* | 62 |
| | 3½" | 91 | 130 | 1296* | 81 |
| | 4" | 122 | 173 | 975 | 81 |
| | 4½" | 156 | 223 | 757 | 81 |
| | 5" | 194 | 278 | 607 | 81 |
| | 5½" | 238 | 340 | 496 | 81 |
| | 6" | 284 | 407 | 415 | 81 |
| | 6½" | 335 | 480 | 352 | 81 |
| | 7" | 390 | 557 | 303 | 81 |
| | 7½" | 450 | 643 | 262 | 81 |
| | 8" | 513 | 733 | 230 | 81 |
| 4"x6"—V-Belt Drive<br>Fig. 4650<br>Five Cylinder<br>125 R.P.M.<br>Steel Fluid Cylinders | 2½" | 139 | 199 | 1500 | 144 |
| | 2¾" | 172 | 247 | 1290 | 153 |
| | 3" | 209 | 297 | 1080 | 154 |
| | 3¼" | 249 | 357 | 925 | 158 |
| | 3½" | 292 | 418 | 765 | 154 |
| | 3¾" | 315 | 450 | 730 | 158 |
| | 3¾" | 338 | 483 | 680 | 158 |
| | 4" | 388 | 555 | 600 | 160 |
| 5¼"x8"—V-Belt Drive<br>Fig. 5830<br>Three Cylinder<br>85 R.P.M.<br>Steel Fluid Cylinders | 3" | 109 | 156 | 1605 | 120 |
| | 3½" | 154 | 220 | 1137 | 120 |
| | 4" | 206 | 294 | 850 | 120 |
| | 4½" | 265 | 380 | 658 | 120 |
| | 4¾" | 297 | 424 | 590 | 120 |
| | 5" | 331 | 473 | 529 | 120 |
| | 5½" | 404 | 577 | 434 | 120 |
| | 5¾" | 442 | 631 | 396 | 120 |
| 5¼"x8"—V-Belt Drive<br>Fig. 5850<br>Five Cylinder<br>85 R.P.M.<br>Steel Fluid Cylinders | 3" | 182 | 260 | 1605 | 200 |
| | 3½" | 257 | 367 | 1137 | 200 |
| | 4" | 344 | 492 | 850 | 200 |
| | 4½" | 442 | 632 | 658 | 200 |
| | 4¾" | 495 | 707 | 590 | 200 |
| | 5" | 552 | 789 | 529 | 200 |
| | 5½" | 673 | 961 | 434 | 200 |
| | 5¾" | 735 | 1050 | 396 | 200 |

*Steel Fluid Cylinder Recommended

DETACH THIS PAGE FOR FUTURE REFERENCE

Fig. 1324

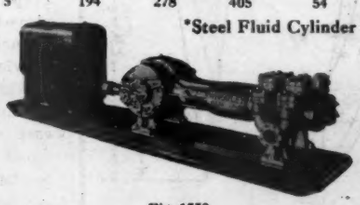


Fig. 1550

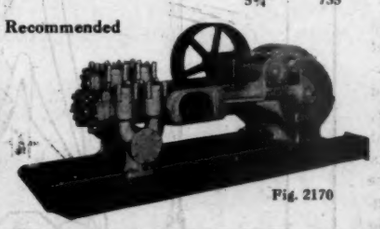


Fig. 2170

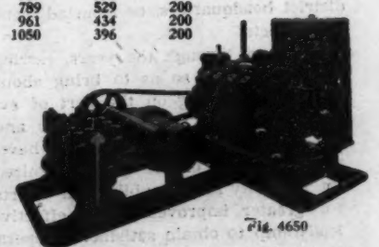


Fig. 4650

# PUMP & VALVE MFRS.

*Specialized Equipment"*

**TULSA, OKLAHOMA**

W. P. NEVINS
Chicago, Ill.

SUPERIOR IRON WORKS
Shreveport, La.

DAVIES SALES & ENGINEERING CO.
New Orleans, La.

# Maintenance of Natural Gas Transmission Lines

By J. H. LANG
Superintendent Lines Dept., Ohio Fuel Gas Co.

**In the operation of natural-gas transmission systems in the present emergency period, certain routine procedures receive special attention because of changed conditions. Practices of an eastern company are reviewed which concern policies dealing with repairs, replacements, equipment, fires, explosions, sabotage, patrolling, economic studies of maintenance, and inspection of property.**

THE Ohio Fuel Gas Co.'s transmission system ranges in size from 2 to 20 in. and some portions have been in existence and active service for 50 years. The greatest current problem is one of maintenance and replacement so as to meet the much greater demand of volume and pressure today than existed when the property was new. The transmission system approximates 7,000 miles of pipe lines for supplying markets which serve a total of approximately 419,000 customers directly, 138,000 indirectly and furnishing service in part to 168,000 more. It has grown to its present size by the consolidation over a long period of 29 smaller companies.

While it is necessary, from time to time, to add increased facilities to more efficiently take care of the peak demand, yet by far our greatest efforts must be concentrated on the effective rehabilitation of our present system. The transmission system includes 44 compressor stations with a total of 70,200 hp., the largest station having a capacity of 26,100 hp.

Purchase gas, industrial sales, wholesale sales, main-line check and town-border measuring stations, totaling approximately 3,000, are operated by the transmission organization.

The maintenance of so vast a property, so as to give uninterrupted service to such a great number of customers, is a problem which requires experience, well-trained employes, alert supervision and constant watchfulness.

As in the case of other large companies, the transmission organization is divided into four main operating departments: compressor, pipe lines, measurement and gas-control departments. The departments, in turn, are divided geographically into divisions and districts.

The divisions in the pipe-line department are further divided into subdistricts. In each subdistrict is located a repairman in charge and one or two repairmen, working from a specially equipped pickup truck. These men take care of all operations and minor maintenance in their area. They are assisted in making replacements and in minor construction work by a crew from the district headquarters, or from adjacent subdistricts.

We have, through the years, carried on job training so as to bring about full understanding on the part of every man of his respective duties and the reasons behind them. We have, since the start of the war, recognized the necessity for redoubling our efforts for greater improvement in effective leadership to obtain satisfactory operation with fewer and less-experienced employes and with material shortages and necessity for using substitute materials. While we have in times past, in some cases, employed specialists and developed some employes so that they eventually became specialists, we now find it necessary to increase the fexibility of our organization so that it is possible for employes to move from one job to another when and as the occasions for such diversified duties arise.

American industry is depended upon to win this war by outproducing our enemies. There is, at the present time, a shortage of qualified men, and as more and more men are called into the military service and defense industries, this shortage will become more of a problem to this as well as other utilities. Replacement labor will undoubtedly have to come in part from below and above the age limit now being drafted into the military service. This makes the problem of job training more important to more quickly bring about the development of the new employes.

Now that we are at war, it is important that employes be carefully checked and thoroughly trained, not only in preventing sabotage but in meeting it when it occurs. By way of meeting this training essential, we developed and distributed several months ago additional wartime sections to our Standard Emergency Manual. The first section of this manual deals with the proper handling of all normal emergencies and provides each employe group with a basis for periodic study of proper action in such of these emergencies as may concern their department. The second section of the manual is devoted to the prepartion of the organization for the prevention of sabotage. This section deals with the development of alert, observing, understanding employes, police contacts, employe identification, fingerprinting, employe and property safeguards, employe police and many other similar items. The third section has to do with policies and practices, training, etc., as to the proper method of meeting sabotage when, if and as it occurs. In this portion of the manual items such as emergency equipment, fire-fighting equipment, fire inspection, emergency training with regard to explosions, fire and first aid, are covered. Preliminary air-raid precautions have been specified.

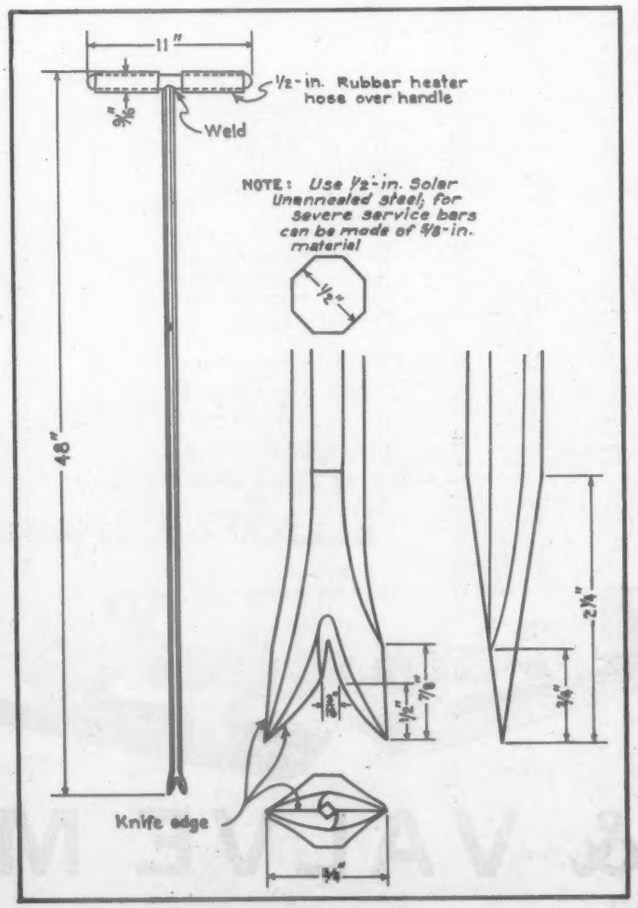



*Fig. 1—Standard bar for testing flash leaks*

The first section of the manual has been in use for several years by way of training the organization to meet normal emergencies. The second and third sections, developed shortly after the first of the year, were distributed throughout the organization and given continual follow up to assure rapid progress. The departments in each location have completed the whole of the program with the exception of the continuing employe group case studies, with regard to bomb explosions, gas explosions, fires and first aid. These case studies are being continued by each group and at all locations by way of keeping the matter alive and the employes alert.

Each department has, in turn, made provision for reasonably satisfactory operations in event of the loss of our communicating system. As an example, each compressor station is being provided with pressure and delivery data so that if communications are lost they can operate with reasonable satisfaction independently. In this case each major station has been provided with data curves, specifying pressures which are to be maintained at various temperatures and wind velocities for each day of the week. Our demands experience rather substantial variations for some

# WHAT'S ALL THIS ABOUT TURBOCHARGING?

## FOR 4-CYCLE DIESEL ENGINES

| | |
|---|---|
| Does it ... per b. h... | It assuredly does — turbocharging allows the weight per hp. to be decreased as much as 25% to 30%. |
| D... actually and depe... engine output, or ...? | Over two million b. hp. of Diesels now equipped with the Buchi system say increased engine output up to 50% is assured. The performance records tell the story. |
| W... does the turboc... | The engine exhaust — normally wasted power — drives the turbine which rotates the blower discharging into the air manifold. |
| What happens w... ine is reversed? | The turbocharger functions just the same — the engine rotation may be reversed, but the direction of the exhaust flow is not. |
| Can turboch... applied successfully to ...sels? | In many cases, yes — but naturally maximum advantages are produced with engines originally intended for turbocharging. |
| What engine ... d types, may be equipped w... rbochargers? | Elliott-Buchi turbochargers are built for turbocharged 4-cycle engine ratings above 250-hp. in marine, stationary, and locomotive Diesels. Few limitations as to type and speed of engine. |
| How can I obt... te data on turbocharging? | Simply write or wire us. If you have specific questions, let us answer them. If desired, an Elliott engineer will be glad to call. |

**ELLIOTT COMPANY**

*Supercharger Dept.*, JEANNETTE, PA.

DISTRICT OFFICES IN PRINCIPAL CITIES

M-54

# ELLIOTT-BUCHI *Exhaust Gas* TURBOCHARGERS

days of the week even under comparable temperature and wind conditions.

While we have given considerable study during the past to more economic operations, we have in recent months redoubled and reconcentrated our efforts along this line. Several years ago we set up a line-patrol schedule, whereby those lines requiring and justifying the most attention would receive the necessary work.

For this purpose, our transmission lines were classified into three classes. "A," lines which are major trunk or market-supply lines, often the only supply to a community. "B," lines which are minor transmission lines, major field-gathering lines and market-supply lines to communities supplied from more than one source. Such lines, if lost, may seriously cripple our service, but would not cause us to lose any markets. "C" are minor field-gathering lines and well lines, whose loss would cause us no particular inconvenience in so far as markets are concerned.

A time schedule was worked out, based on diameter and line pressure, for each of the three classes, whereby the interval between patrolling each line of the various classes was scheduled in proportion to its size and operating pressure.

This schedule was based on average conditions. For new lines or new portions of lines in first-class condition, the intervals as shown on the schedule were often doubled. For those lines or parts of lines which are old, where considerable leakage and trouble might be expected or where hazardous conditions existed, the interval was generally cut in half.

While the above reflects basic patrol schedule preparation, the patrol schedule for each pipe line or section of pipe line is periodically checked for possible revision so as to best meet current conditions.

For example, the patrol schedule for a given line indicates a 5-day period between patrol activities. During the last several times of patrolling, no leaks of any consequence, nor any indications of fluid, line washes or trouble of any kind were found. The schedule of this particular line is then extended to a 10-day period and the efforts of the employes directed to lines where patrolling will be of more value and where experience indicates trouble is more liable to occur. Of course, the schedule for each classification of line has a maximum permissible period of time between patrol activities to preclude the possibility of any line being neglected entirely.

In as much as most of Ohio is fairly well covered with passable roads, line patrolling is accomplished, in general, by two men working from a car. They drive from their subdistrict headquarters to the location from which they intend to start their patrol activities. One man gets out of the car and starts walking line through this section. The remaining man drives on to a convenient place where the pipe line crosses a road and parks the car at that point, himself continuing on in the direction they are patrolling. When the first man comes to the car, he drives it around to the next road crossing and this process is continued until the line, or section of line, being patrolled is covered. Generally when leaks are found the repairs are made by the two men at that time, thus combining the repair work with the patrolling of the line. This makes one trip accomplish the work formerly requiring an additional trip, resulting in more economical operation.

### Line Maintenance Policies

We have, in a sense, been following two general line-maintenance policies. The first is that repairs are not made to those leaks too small to justify the cost of such repairs.

To enable us to properly classify repairable leaks, we have carried on considerable investigation and developed a new-type leak-testing bar (see illustration) which tends to loosen up the soil close to the pipe and thereby allow leaking gas to escape from surrounding earth more freely. With this particular bar we have, from repeated investigation and measurement of escaping gas, been able to substantiate the fact that those leaks which will not flash or burn at the surface do not justify repairs. The hazard involved in such minor leaks is of course given careful consideration.

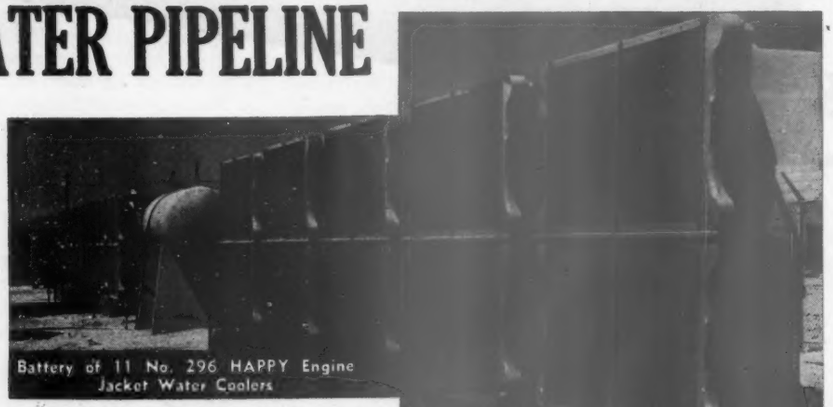
Secondly, we utilize the following policy when considering replacements. When the net cost of repairs plus value of annual leakage arises to a predetermined per cent of the net cost of the replacements, then we feel that we are economically justified in rebuilding that section of property.

Of course when continuous dependable service is involved, this feature alone may entirely overshadow economic justification.

Normal repairs, operation and maintenance of lines and regulators, and other pipe-line equipment are handled in the same manner as in other similar industries, and for that reason are not covered in detail. The one exception to the above may be that in years past it was practice to maintain one or more regulator specialists in the department. In more recent years, however, through regulator classes and employe training, practically all of the regular employes have been trained to make all repairs and adjustments to regulators in the field, excepting those regulators requiring a complete machine-shop overhaul. Recognizing the importance of regulators, it is our policy to inspect each regulator once a month, and at least once a year each regulator must be completely dismantled, inspected and repaired.

Good housekeeping is important now more than ever before because it is basically related to all the other factors of good supervision, involving costs, quality, quantity, and speed of work accomplished. The absence of good housekeeping


Happy Coolers SAVE STEEL ON 40-MILE WATER PIPELINE



Battery of 11 No. 296 HAPPY Engine Jacket Water Coolers

At Compressor Station No. 2, The El Paso Natural Gas Company was faced with the problem of constructing a 40-mile water pipe line to obtain 60,000 to 100,000 gallons of water per day for cooling six 800-hp. Cooper-Bessemer Type 19 twin-tandem double-acting horizontal gas-engine compressor units, plus 400-hp. of auxiliary engines.

A battery of eleven No. 296 HAPPY Engine Jacket Water Coolers and a battery of five No. 232 HAPPY Single Stage Coolers were installed. This eliminated the need for the pipe line, as the HAPPY Jacket Coolers required only a nominal amount of water per day for make-up. This installation is the first large-scale cooling of natural gas by air on a large gas pipe line.

There's a HAPPY Cooler to economically solve your engine jacket water and gas cooling problems, whether there is an abundance or a scarcity of water.

IF YOU NEED COOLING FOR:

- Jacket Water
- Natural Gas
- Compressed Air
- Lubricating Oil
- Steam
- Hydro-Carbon Vapors

CALL HAPPY ENGINEERS

Write The Happy Co., 310 East 10th Street, Tulsa, Okla.

Battery of 5 No. 232 HAPPY Single Stage Gas Coolers. Capacity at 500 lbs. Working Pressure

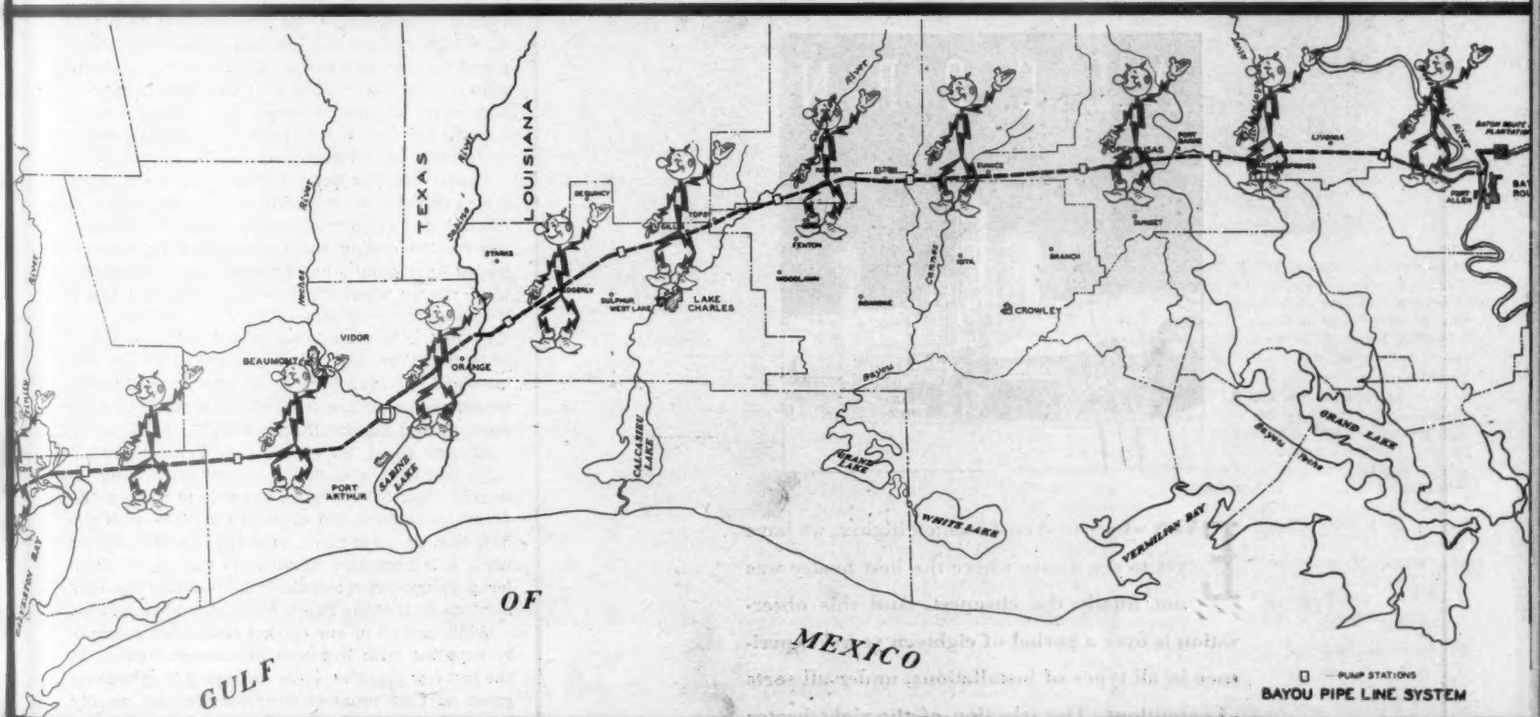
The Happy Company
TULSA, OKLAHOMA

# *Again Gulf States is Picked to Serve the Oil Industry— and the Nation*

The Bayou Pipe Line System from Baytown to Baton Rouge will use electric power throughout for its pumping requirements. Nine of the eleven pump stations will be served direct by Gulf States Utilities Company and another will be served indirectly.

This system, which will tie-in with the Plantation Pipe Line System at Baton Rouge, will connect the refinery areas of the Houston and Sabine districts to the Eastern seaboard. The Plantation Pipe Line now extends from Baton Rouge, Louisiana to Greensboro, North Carolina and will be extended to Richmond, Virginia.

Gulf States Utilities Company also furnishes electric power to the terminal station of the Plantation Pipe Line System.




DEPENDABLE
GULF STATES UTILITIES CO.
PUBLIC SERVICE

**GULF STATES UTILITIES CO.**

**General Offices: Beaumont, Texas, Lake Charles and Baton Rouge, Louisiana.**

is a factor in employe grievances, accidents and poor morale.

All of us have seen departments untidy and poorly arranged, cluttered up with waste and scraps, dirt and unused materials. The workers move slowly and lose time looking for tools, equipment and stocks. All these things require man hours and increase costs. The worker who is exposed to a poorly planned, cluttered and dirty department is in danger. Many of the outstanding accident hazards can be removed by good housekeeping. There are fewer grievances of a minor nature in departments where good housekeeping prevails than in those that are ill kept. Efficient and effective operation today requires not only cleanliness but effective, good housekeeping.

The work of repairman in charge, and repairman, together with the supervision given by the district foreman, is continuously spot checked by general inspectors who are scheduled every 4 years to have completely covered the entire property. The general inspectors each year cover a certain portion of the property in each division and make a report in detail indicating the actual condition of the property as found at the time the inspection is made.

The mounting material and labor costs, along with various forms of increased taxation, make necessary rigid cost analysis if the utilities are to survive. The difficulty of obtainng materials and qualified labor, and in some cases the necessity to use substitutes, require extraordinary effort for a further economy program, involving not only the key supervisors, but every employe in the organization as well.

The shortage of rubber and the difficulty encountered in securing replacement tires have brought about many changes in our automobile operation. Through reorganization and rerouting we have been able to limit the use of company cars to absolutely necessary and shorter trips. thereby considerably reducing mileage. All automobile drivers are being thoroughly trained in the proper operation and care of the automotive equipment. Regular checks are made on the equipment, tire pressures and the switching of tires to reduce wear through uniformity of use.

Realizing that the shortage of materials, the use of substitute materials and the use of untrained new employes all have a tendency to increase operating expenses, here again we have redoubled our efforts toward greater and closer control of our operating expenses. To properly follow up and analyze costs in the transmission division, the following basic units have been established and used.

In the gas-measurement department the most effective control has been exercised through the use of the comparative cost statement prepared on a unit cost per weighted meter operated and the use of the meter registration base. In the compressor department unit cost per brake horsepower developed is used. In the pipe-line department, the unit cost per mile of 3-in. equivalent pipe line operated is the basis. While the foregoing does not furnish everything that is desired, it has afforded reasonable control and permits comparison to be made between operating districts, divisions and compressor stations.

We have mentioned earlier the fact that by far the greater part of our major construction work consists of replacing those portions of the pipe line system which, due to their age and consequent deterioration, require such replacement for continuous uninterrupted service.

### Reconditioning Work

Our reconditioning work consists in annually stress-testing all of our major lines. Stress tests consist of subjecting the line involved to a pressure higher than the maximum pressure anticipated for the line. The maximum stress pressure used during tests varied with the maximum pressure available, but in practically all cases is at least 20 per cent higher than the maximum operating pressures expected.

Experience has proven that such stress tests are very valuable in locating the weak spots in the line and quite often assist materially in locating trouble during the low demand or summer period that would not perhaps occur otherwise until winter when the lines are subjected to extreme high pressures.

From the information obtained on these stress tests, together with drop-pressure tests on the lines and our record of repairs over several years period, we determine the sections needing replacement during the summer season.

In some cases this replacement is accomplished by laying a parallel line, tying up and taking up the old pipe. In others we are able to remove the present line from the ditch and replace with the new line. In some cases, especially on the smaller lines, it is necessary to resort to the use of Mueller pressure-control fittings in making the connections so that the line is continuously in service.

While not all of our market lines were originally supplied with bypasses at main-line gates, in the last few years we have succeeded in relocating gates so that uninterrupted service can usually be rendered to all important markets. Only a few minor markets remain which are connected with single tap to the main supply line.

In such cases we have successfully carried the market while installing a gate setting or making pipe replacements, by use of the Gardner Goodman stopper, which in the case of an 18-in. line will withstand approximately 2½ lb. To enable us to do this, we use a portable compressor, taking the gas at 2½ lb., pumping it to the required market pressure for delivery while the repairs are being made.

Generally in the past we have been able to start construction with a supply of new or reconditioned pipe, which was welded into 80-ft. sections on the line. The pipe removed, of course,


THE CHEAPEST WAY TO GET BEST RESULTS IS WITH THE PROPER HEATER

EVEN where first cost seemed higher, we have yet to see a case where the best heater was not finally the cheapest. And this observation is over a period of eighteen years' experience in all types of installations, under all sorts of conditions. The selection of the right heater is not a simple problem. We will be glad to help you solve it.

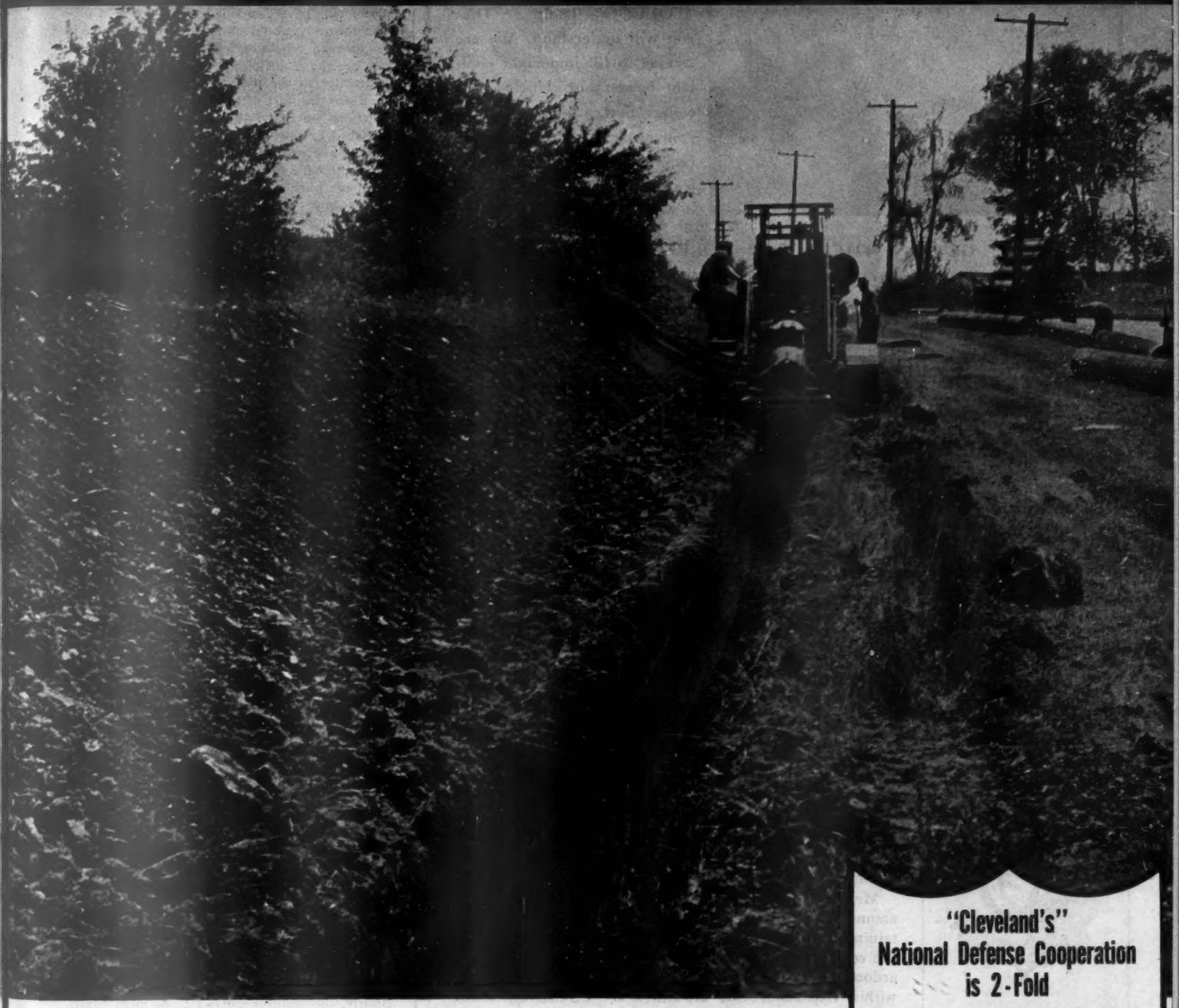
ALCORN COMBUSTION COMPANY

SCHAFF BLDG., PHILADELPHIA

LOS ANGELES HOUSTON SAN FRANCISCO

# "CLEVELANDS" Have ... For Over 20 Years

- RAISED PERFORMANCE LEVELS
- DECREASED INITIAL COST
- LOWERED OPERATING COSTS



**"Cleveland's" National Defense Cooperation is 2-Fold**

**1st—Supplies equipment for Defense Pipelines and all branches of the United States Military and Naval Services.**

**2nd—Releases thousands of tons of vitally needed steel for armament, tanks, ships, etc., because of weight-saving design and construction.**

★ Ever since its entrance into the ditching machine field, over twenty years ago, "Cleveland" has blazed a path of fresh ideas —constant improvement. • Unswerving continuance of this policy is our promise for the future, so that you, whenever you purchase a new Cleveland, can be assured of the most modern in engineering design, backed by the best there is in construction.

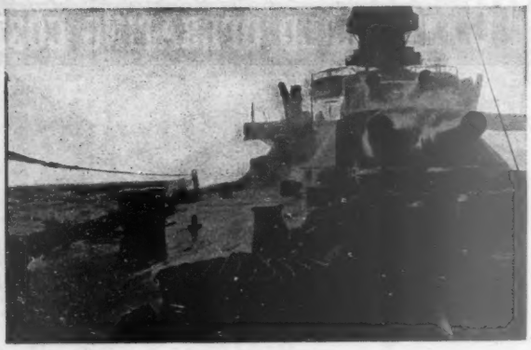
**BUY WAR BONDS—TURN IN ALL SCRAP RUBBER AND METAL**

THE CLEVELAND TRENCHER COMPANY

20100 ST. CLAIR AVE. *"Pioneer of the Small Trencher"* CLEVELAND, OHIO

"CLEVELANDS" Save More . . . Because they Do More

## "TOLEDO" HAS GONE TO WAR



—for the duration. If you do not receive your order of "TOLEDO" Tools or Dies you will understand. We are strving to fill important civilian needs but Uncle Sam comes first. We will get to your order as soon as Military requirements are filled. America must win—and will win—if we all help.

GET IN THE SCRAP—COLLECT THE SCRAP FROM YOUR PLACE AND SELL IT TO A SCRAP DEALER. AMERICA NEEDS YOUR SCRAP. DO YOUR PART.

**THE TOLEDO PIPE THREADING MACHINE COMPANY**
**TOLEDO, OHIO** NEW YORK OFFICE, No. 2 RECTOR STREET

"TOLEDO"
MAKERS OF FINE
PIPE TOOLS, POWER PIPE MACHINES, VISES, BENCHES

## Mercoid is the answer to THE OIL INDUSTRY'S CONTROL PROBLEMS

**Explosion-Proof Controls**

EXPLOSION-PROOF PRESSURE CONTROL

EXPLOSION-PROOF TEMPERATURE CONTROL

**The oil industry assumes major responsibilities in looking after the nation's unprecedented requirements during war emergencies.**

**In the midst of high pitched activity, there is a demand for safety measures all along the line. There is no time for taking chances.**

**Mercoid Controls have a wide application in the oil field, among which are the protection of costly bearings, maintaining liquid levels and various other problems involving the control of temperature and pressure. Wherever hazardous conditions prevail, Mercoid Controls encased within Explosion-Proof Housings are extensively used.**

**Mercoid Controls are especially suitable for oil field applications, because mercury switches are used exclusively. A Mercoid switch is not subject to open arcing—the contacting surfaces are hermetically sealed within a glass tube where they are protected from all outside adverse conditions. They are not affected by dust, dirt or corrosion. There is no such thing as pitting or sticking of contacts, thus assuring better control performance and much longer control life.**

**Whatever your control requirements may be, it will be to your advantage to specify Mercoid.**

**Our engineering staff will cooperate whenever you have a control problem.**

**A complete catalog mailed upon request.**

THE MERCOID CORPORATION • 4227 BELMONT AVE. • CHICAGO, ILL.


was in 20-ft. lengths. This pipe was graded, cleaned, spot-welded, welded into 40-ft. lengths, and stored for the next job of a similar kind. Now, however, we often find it necessary to rehabilitate the pipe for immediate reuse on the same job.

The present difficulties in obtaining pipe for replacements have compelled us to spot-weld pipe which formerly would have been sold because of the excessive rehabilitation costs. Since replacements are the result of corrosive soil, it has been our practice in the past to coat all replacement pipe. Since the start of the war and the resultant restrictions on materials, we cannot follow our established practices to the fullest extent. Therefore, we have reduced the extent of our coating to the exceptional and highly corrosive areas.

We have purchased several cleaning machines and are now working on the development of flame-cleaning methods of reconditioning pipe. We have several electric welding machines which are used in spot welding and, in addition, for general pipe-line utility welding wherever needed.

It has been the policy of this company to contract much of our replacement and new construction work, where favorable contracts could be negotiated. The large part of the contracting has been done by local contractors, who, while not equipped for a major pipe-line construction job, are able to handle these smaller jobs in an economical manner. We have found it advantageous at times to rent these contractors certain of our construction equipment to fill out their complement of machinery to properly handle the job. We, however, do enough of the work ourselves to enable us to keep a close control on cost and take over if the contractor falls down on the job.

### Contractor Relations Satisfactory

Our results with contracting in general has been very satisfactory. One of the most important points, all things being equal, in favor of contracting, is the fact that we are able to operate with very little payroll turnover. In general, we usually do most of the welding ourselves as the local contractors are unable to handle welding work and meet requirements of our specifications.

Welding specifications and inspection standards are things upon which we place great stress. All company welders are checked at least twice a year and frequently more often.

One of the methods we have utilized in recent years to help meet our peak demand has been the use of underground gas storage. At the present time we have storage capacity in excess of 20 billion cubic feet and, by this means, have greatly increased the load factors on our major transmission lines. This storage has given us sufficient reserves to date to meet our rapidly growing peak demands.

We have tried to present an outline of our transmission work, with special emphasis on those features and methods of operation which are basic in our pipe-line work.

Briefly, the features we feel to be most important are: Job training, line-patrol schedule, leak classification, economic justification for leak repairs, economic justification for line replacements, general inspection of property, and cost analysis on comparative basis.

Present conditions under wartime regulations are making it increasingly difficult to operate, repair, and replace pipe lines. We must depend more on temporary repairs when good sound economics would justify more permanent repairs.

We must search our system carefully for reclaimable lines which can be salvaged entirely or replaced with smaller lines. We must repair and salvage material formerly considered obsolete. In short, we must redouble our efforts for economic operation and maintenance, together with increased training of all employes in all phases of the work, if we are to meet our present situation with credit.

# "TAKE UP" with KELLOGG

**How to produce speedily and economically 100-octane aviation gasoline required in the national defense program.**

**Find out how Kellogg-built high octane gasoline plants utilizing the latest and most efficient processes are now aiding in this vitally important program.**

**To take advantage of Kellogg's experience in all branches of processing, engineering and construction is one of the best ways for any refiner to help to "keep 'em flying."**

# KELLOGG

**THE M. W. KELLOGG COMPANY**

**JERSEY CITY, N. J. • 225 BROADWAY, NEW YORK**
**Los Angeles: 609 South Grand • Tulsa: Philtower Building**

**DESIGN, CONSTRUCTION and LICENSING**

- **Catalytic Processes for Cracking, Hydroforming, Reforming, Dehydrogenation, Alkylation, Desulphurization**
- **Gasoline Products Company, Inc. . . . . Pyrolytic Cracking**
- **The Polymerization Process Corporation, Thermal and Catalytic Polymerization**
- **JUIK Processes . . . . . for Lubricating Oil Refining with Propane and Phenol • Deasphalting • Dewaxing • Solvent Extraction and Acid Treating Plants**

Thermal Reversion
Thermal Polymerization
Alkylation
Catalytic Polymerization
Hydroforming
Cracking Continuous Process

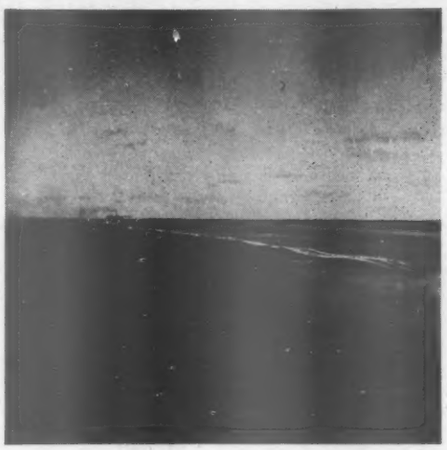
# Problems Presented by Water Crossings on Short Line

HOUSTON NATURAL GAS CORP., which supplies fuel to numerous training camps and vital war industries in the Gulf Coast area, was recently called upon by the Government to furnish gas to isolated army camp sites on Matagorda Peninsula and Matagorda Island in Matagorda County, Texas. The marshy terrain and two water crossings presented many problems but exceptionally fast time was made despite the difficulties involved.

The project embraced the laying of 25 miles of a combination 2-in. and 3-in. gas line from the Powderhorn gas field in Calhoun County, Texas, to the camp sites which were laid out by the Army Air Corps for use principally as gunnery and bombing ranges. The right-of-way consisted of 13 miles through the heart of the huge 26,000-acre Powderhorn ranch and two 6-mile water crossings of Matagorda Bay.

Contract for laying of the line was let to Latex Construction Co., Houston, Tex., and work was started July 1. Almost simultaneously heavy rains turned the ranch into marsh land and it soon developed that it was even more difficult to cross the ranch with pipe than it was to lay pipe across the bay. The marshy terrain made it necessary to have all pipe dragged in with tractors while mule teams and a six-wheel-drive army truck was required to complete the field regulator station at the gas field, located on the shore of Powderhorn Lake, discovered about 2 years ago by Continental Oil Co.

The depth of water across the bay ranged from 3 to 18 ft., and it was necessary at first to weld the pipe into sections on land and place the sections on pontoons. The pontoons were then towed



*Pipe supported by pontoons being towed across bay. Depth of water varied from 3 to 18 ft.*

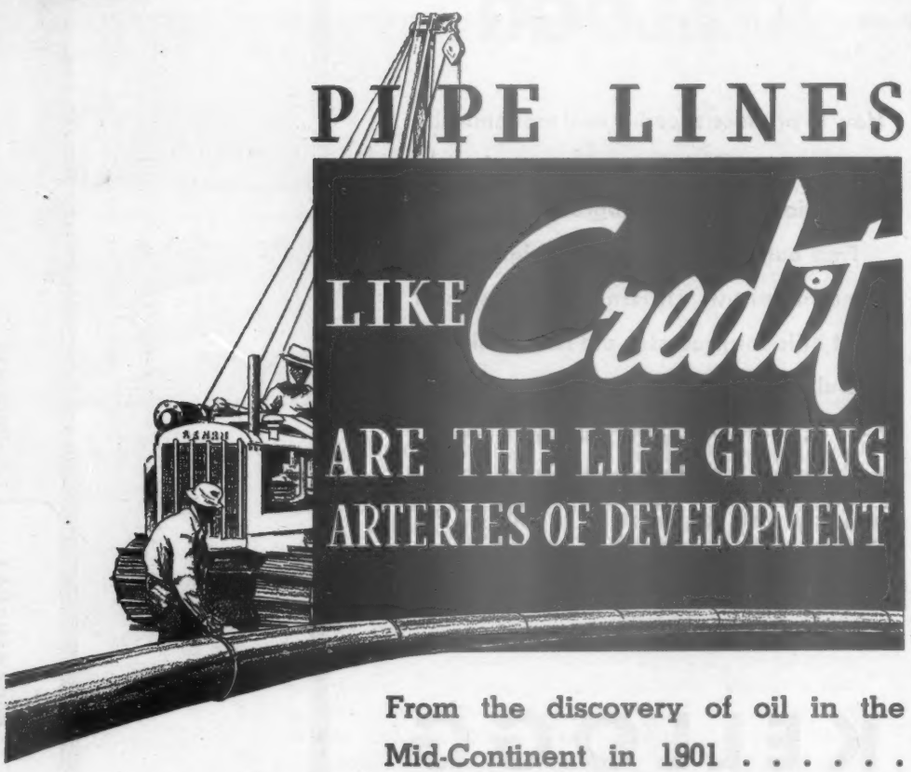
by a tug to positions staked out in advance by the surveyors, and anchored. A specially designed welding barge was then used for welding and as each section was completed it was rolled from the pontoon and submerged. The pipe was protected against salt water by a special somastic coating which was applied at the barge. In addition extra precautions had to be taken against mud, water, and sand getting into the pipe. These factors made the construction much more expensive than under normal conditions.

The greatest difficulty presented was that supplies had to be brought from a considerable distance, making it necessary for those in charge to anticipate construction needs far in advance so that construction would not be slowed down for lack of materials.

In spite of the difficulties that prevailed, the efficiency with which the line was laid is reflected by the fact that gas was delivered to its destination within 30 days after work was started and this was about 30 days less than originally anticipated. The line is capable of supplying 50,000,000 cu. ft. of gas annually to the two camps.

*Specially equipped welding barge on which sections were welded before lowering into bay*


1st of Tulsa
47 YEARS UNINTERRUPTED SERVICE



PIPE LINES
LIKE Credit
ARE THE LIFE GIVING
ARTERIES OF DEVELOPMENT

From the discovery of oil in the Mid-Continent in 1901 . . . . . FIRST NATIONAL Oil Financing has been an artery of development to every branch of the Industry.

DIRECTORS

B. F. BARNETT, Vice President
W. M. BOYARD, President, Boyard Supply Co.
J. P. BYRD, Jr., Vice President
F. L. DUNN, Executive Vice President
A. L. FARMER, Real Estate
M. N. GIRES, President, Deep Rock Oil Corp.
ELMER HALE, President, Hale-Halsell Co.
A. I. LEVORSEN, Geologist
JOHN D. MAYO, President, Mayo Hotel Co.
R. OTIS McCLINTOCK, President
F. S. PARROTT, President, Landes Oil Co.
J. L. SHAMBLY, President, Frick-Reid Supply Co.
W. G. SKELLY, President, Skelly Oil Co.
R. ELMO THOMPSON, President, Superior Oil Co.
GARY Y. VANDEVER, Vandevers
W. K. WARREN, President, Warren Petroleum Corp.

THE FIRST NATIONAL BANK AND TRUST COMPANY OF TULSA — FOUNDED 1895

SAFETY SINCE 1895

THE FIRST NATIONAL BANK AND TRUST COMPANY

Member Federal Deposit Insurance Corporation

# Protecting Transmission System Against Surface Subsidence

By JULIAN GARRETT
Northwestern Utilities, Ltd.

**A natural-gas transmission company operating in the vicinity of Edmonton, Alberta, in northwestern Canada, has been confronted with a peculiar set of conditions due to the fact that ground under one of its lines is subsiding as a result of coal-mining operations. This article discusses studies made regarding the problem in order to prepare for such matters as sagging of the lines and automatic closing of valves in case of line failure at this point**

OUR original transmission system had consisted of approximately 36½ miles of 10¾-in. pipe and 40½ miles of 12-in. pipe. For a number of years we had been gradually looping the original line with 12¾-in. pipe. The 10¾-in. pipe at the field end of the line had been completely looped, and in the spring of 1937 we were to loop the 5 miles immediately adjoining Edmonton.

At this time we found ourselves confronted with an unusual situation. A coal mine which was operating a 6-ft. seam of lignite coal 160 ft. below the surface had made application to the Government for permission to cross the road in which our 12-in. pipe line was laid. This pipe line was on the north side of the road allowance and the new 12¾-in. line was to be constructed along the south side of the road allowance, the two lines to be about 57 ft. apart.

After consultation with a mining engineer who was retained by the company, representations were made to the Government as to precautions which should be taken to protect the road and, incidentally, our pipe line from damage due to subsidence. Some regulations as to barriers were made by the Government when the mining company first crossed the road. Subsequently, however, the Government permitted the coal company to cross the road by the long-wall method of mining. The coal company had offered to leave a barrier on each side of the road if we would pay them 25 cents a ton for the coal left in place. Some 240,000 tons were involved, which would cost us $60,000. We therefore decided to design our pipe line in such a manner that it would be sufficiently flexible and capable of elongation to stand up under a disturbance of the surface without rupture or serious leakage. We asked our mining engineer to advise us what in his opinion would be the maximum subsidence of the surface and across what minimum span, should the coal company carry on its operations with the object of extracting all the coal. He reported that in his opinion the maximum subsidence would be 4 ft. across a minimum span of 80 ft.

It is impossible, of course, to predict the nature of the curves which would be introduced into a pipe line because of surface subsidence. For purposes of computation, however, it was necessary to assume some type of curve, and we considered that if we assumed that the sag in the pipe might take the form of a double reverse

*(Continued on Page 148)*

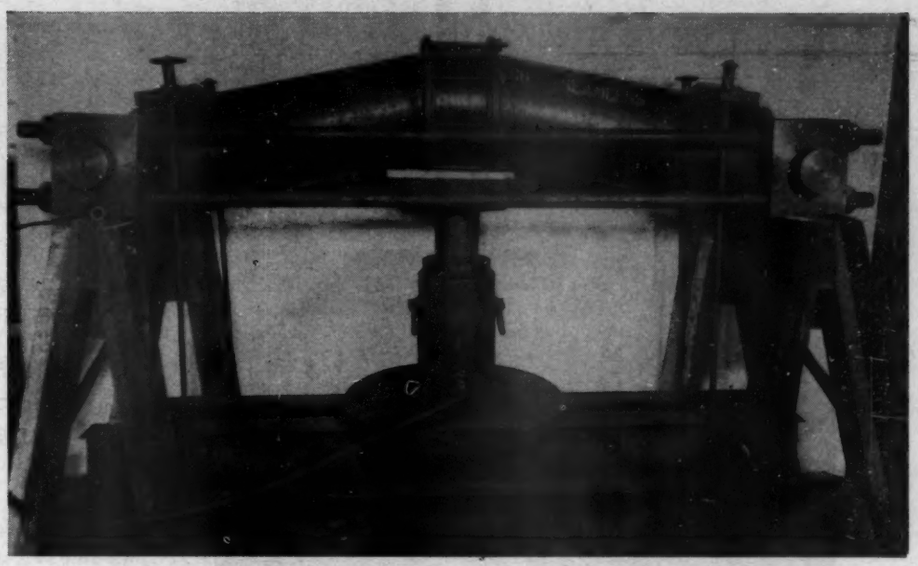
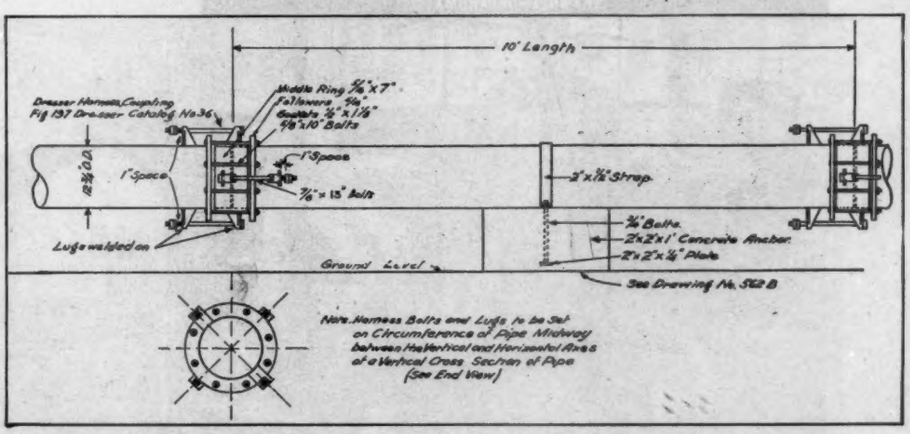


*Fig. 2—Equipment for determining maximum safe deflection angle at each joint. The assembly was subjected to a pressure of 200 lb. per sq. in. and to 500 lb. per sq. in. without leakage*


10' Length
Dresser Harness Coupling Fig 137 Dresser Catalog No 36
Middle Ring 5/16" x 7"
Followers 3/8" Double ½" x 1 1/8"
7/8" x 10" Bolts
1" Space
1" Space
12¾" O.D.
7/8" x 13" Bolts
2" x ½" Strap
¾" Bolts
2'x2'x1' Concrete Anchor
2'x2'x¾" Plate
Lugs welded on
Ground Level
See Drawing No. 562 B
Note Harness Bolts and Lugs to be Set on Circumference of Pipe Midway between Horizontal and Horizontal Axes of a Vertical Cross Section of Pipe (See End View)

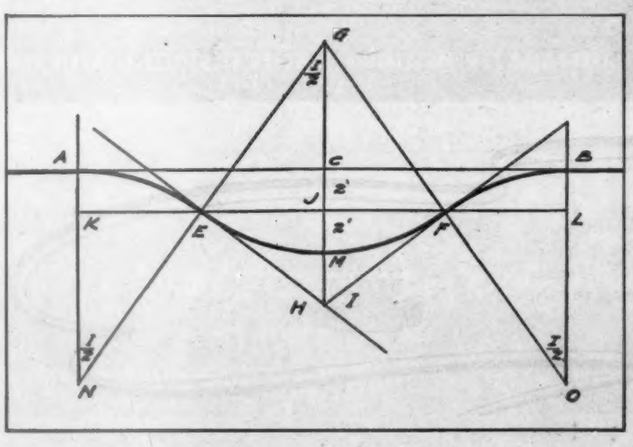



*Fig. 3 (above) Extra-heavy middle rings were used to resist the stresses tending to distortion*

*Fig. 1 (left) Calculation of pipe length assuming sag in pipe might take form of double reverse circular curve*

$I$ = intersection angle of curve
$M$ = middle ordinate = $AK = JM = BL$
$C$ = long chord = $EJF$
$R$ = radius = $NE = GE = OF$
$D$ = maximum depth of subsidence expected
$S$ = span of subsidence cavity = $AB$

# It's An Important Moving Oil Thru

GATHERING STATION, POWERED BY UTILITY ELECTRIC POWER
SHAWNEE, OKLAHOMA

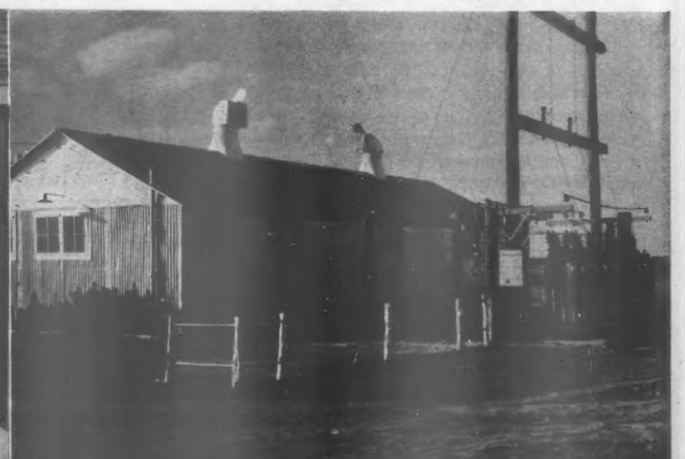
FEW OF HUNDREDS OF STATIONS . .

Suppose we had entered the war without a pipe line system. Imagine what would happen to motor transportation, and to our land, sea and air forces if they were entirely cut off from oil and gasoline!

Of course, this is supposition. But it does remind us of the fact that the pipe line is the life line of industrial America through which vital power fuel must be kept flowing.

The present installation of hundreds of miles of new pipe line is a step toward providing this assurance of an adequate supply of petroleum products to the central and eastern states.

INTERIOR OF PUMP STATION SHOWING ELECTRICALLY DRIVEN GASOLINE PUMPS



TRUNK LINE PUMPING STATION, POWERED BY UTILITY ELECTRIC POWER
MEEKER, OKLAHOMA

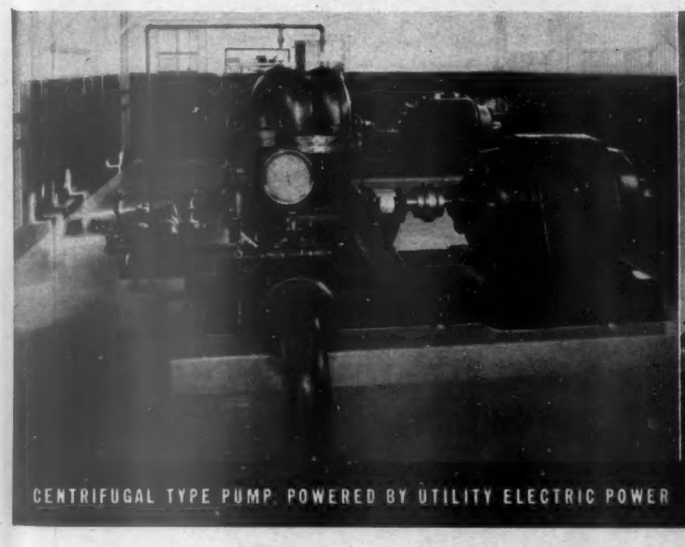
The Petroleum Electric Power Association is the outgrowth of a desire on the part of electric power companies to render greater service, through cooperative effort, to the Petroleum Industry.

# Job . . . A Vital Task . . . This Pipe Lines For Victory . . . !

. . POWERED BY UTILITY ELECTRIC POWER
PROLONG THE LIFE OF YOUR MOTORS
1. Establish a dated maintenance schedule.
2. Check clearance, bearings, contact fingers, control equipment, and oil in distribution transformer.
3. Check air gap and varnish coils.
4. Examine commutator and brushes.
5. Check oil level in bearings.
6. See that shaft is free of oil and grease from bearings—keep oil where it belongs.
7. Keep windings clean.
8. Check alignment of motor with machine to which it is directly connected.
9. Clean motor thoroughly, blowing out dirt from windings and wipe commutator and brushes.
10. Examine brush holders and clean them if dirty. Make sure that brushes ride free in the holders.
11. Drain, wash out, and renew oil in sleeve bearings.
12. Check operating speed or speeds.
13. Check grease in ball or roller bearings.
14. Check current input and compare with normal.
15. Run motor and examine drive critically for smooth running, absence of vibration, worn gears, chains, or belts.
16. Keep worn-out parts for exchange on new purchases.

Once the pipe is laid the important remaining factor is the selection of adequate and efficient power to move the oil through the lines. In this respect, Utility Electric Power tops them all for economy, efficiency and all 'round performance.

Records established from pipe line stations operating many years by Utility Electric Power, bear out the above facts. They reveal the low initial, maintenance and operating cost of this modern power. They prove that Utility Electric Power is dependable when used continuously or for intermittent service. They show that this is truly the power capable of coming through with flying colors when we are driving for VICTORY!



CENTRIFUGAL TYPE PUMP. POWERED BY UTILITY ELECTRIC POWER

PIPELINE STATION. POWERED BY UTILITY ELECTRIC POWER
GOLDSMITH POOL TEXAS

**HELP STAMP OUT OUR ENEMIES—BUY WAR BONDS AND STAMPS**

*Use Utility Electric Power!*

PETROLEUM ELECTRIC POWER ASSOCIATION

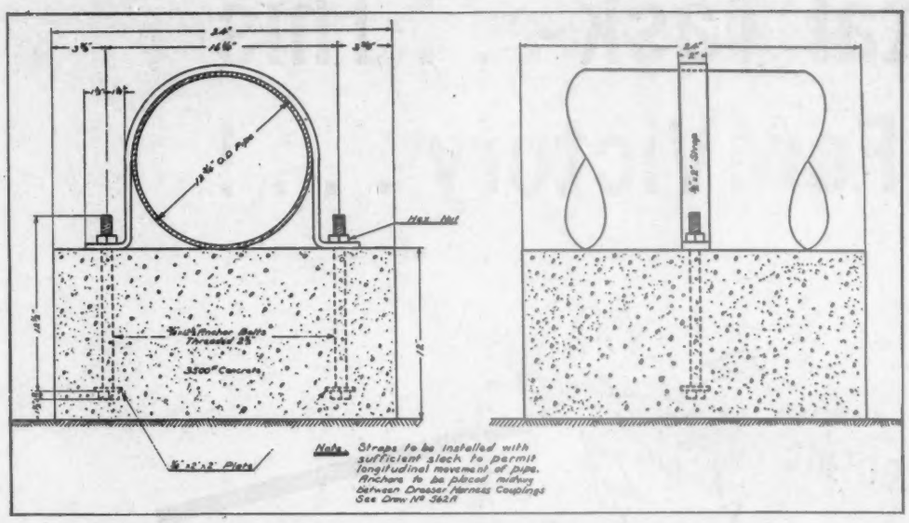

Hex Nut
Note. Straps to be installed with sufficient slack to permit longitudinal movement of pipe. Anchors to be placed midway between Dresser Harness Couplings
See Drawing No 362A

*Fig. 4—To protect pipe from kicking about under pressure it was strapped down to concrete anchors*

*Fig. 5—Closeup view of joint shown in Fig. 3*

*(Continued from Page 145)*

circular curve, as shown in Fig. 1, it would enable us to calculate with sufficient accuracy what pipe lengths should be used so as not to exceed a safe maximum deflection angle at each joint. Such a curve could also be used to guide us in deciding upon a safe allowance for elongation.

We were using 12¾-in. o.d. pipe with a wall thickness of ¼ in. and corresponding style No. 38 Dresser couplings with $\frac{7}{16}$ by 7-in. middle rings. We desired advice as to the maximum safe deflection and I submitted our plans to Merrill N. Davis of the Dresser Manufacturing Co. He turned the problem over to his chief engineer, George H. Pfefferle, who carried out a test, shown in Fig. 2. The following is quoted from his report:

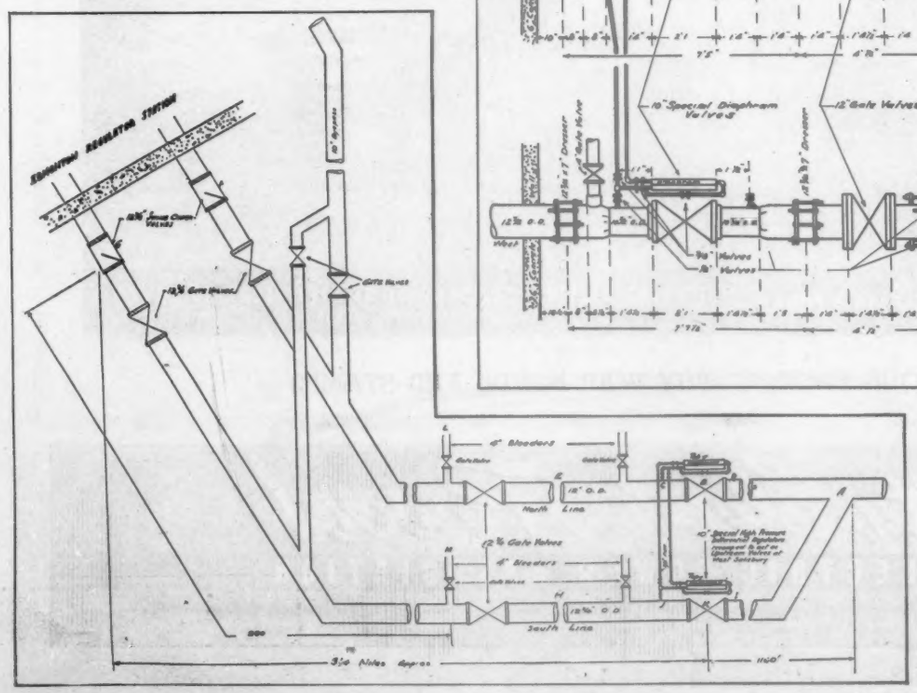
"We set up a coupling of the same specifications that you propose to use on two pieces of 12-in. i.d. seamless pipe and subjected the entire assembly to a pressure of 200 lb. per sq. in. which we understand is your working pressure. It was our intention to deflect the pipe with a hydraulic jack until the failure of some part occurred, and then arrive at the maximum safe deflection by applying a suitable factor of safety against the angle required to produce failure.

## No Leakage Throughout Test

"With 200 lb. pressure on the couplings, the pipes were deflected to a total of 19° without leakage. The pressure was then increased to 600 lb. while the deflection was increased another 3° to a total of 22°. No leakage occurred throughout the entire test. We did not carry the test to destruction because we started with a separation of the pipes of 1½ in., and a further increase in the deflection might cause the pipes to pull out of the coupling at one side.

"We believe that a factor of safety of two is ample to apply to the results of this test, but if you prefer to use a larger factor of safety the resulting safe deflection angle will still be large enough to take care of any deflection that is likely to occur in the installation you have in mind."

As a result of this report we decided to adopt



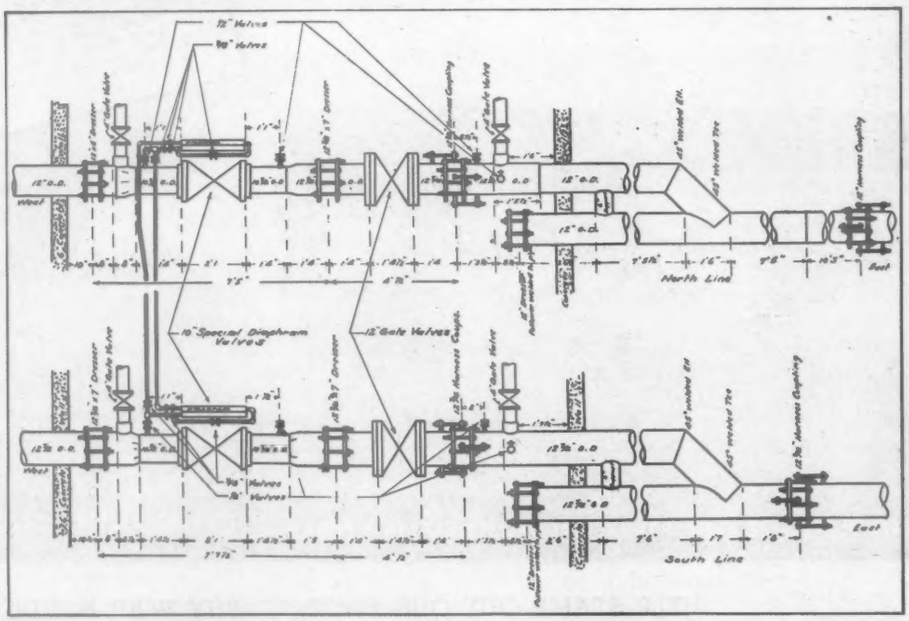



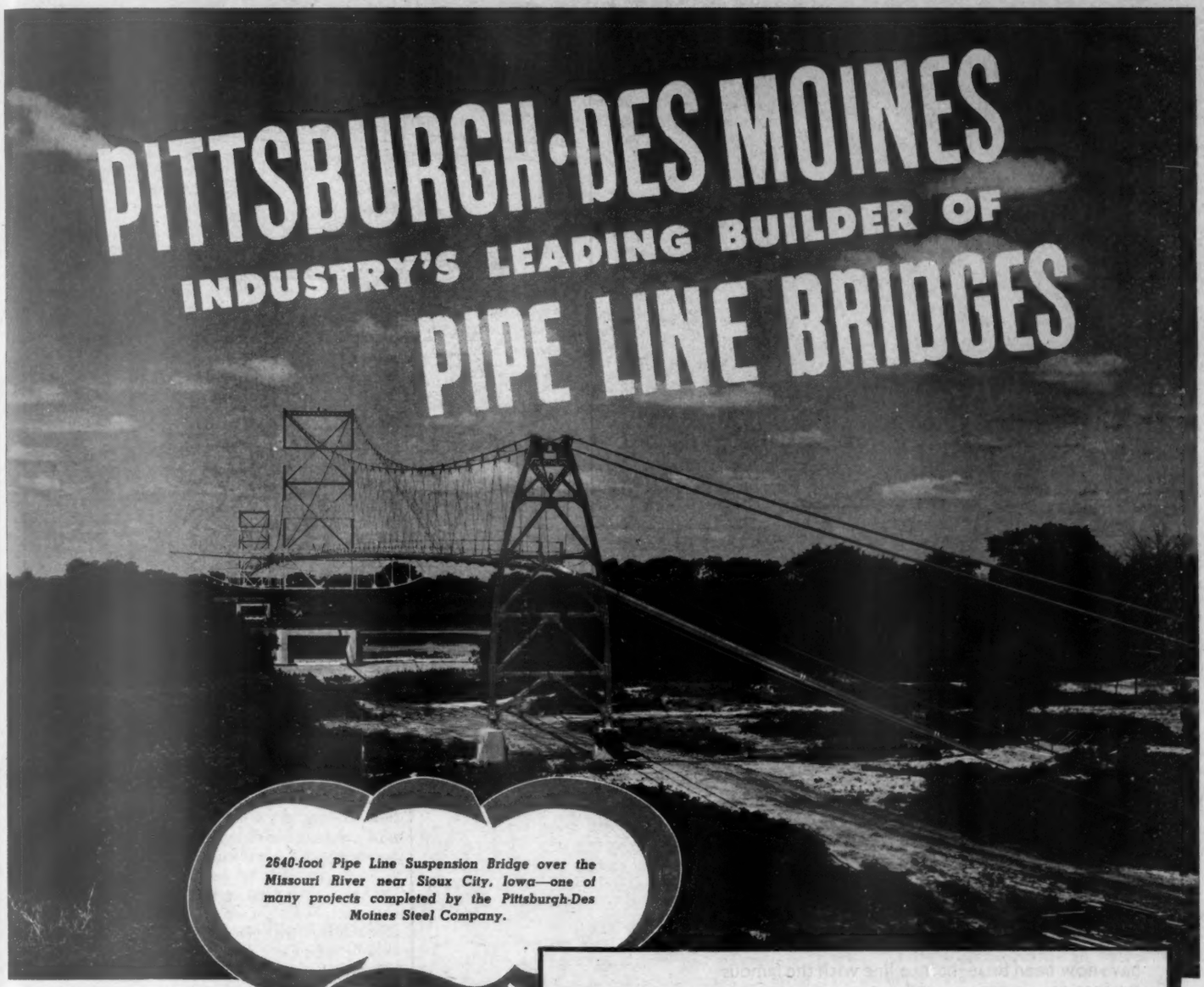

*Fig. 6 (left) Diagram showing installation of upstream and downstream valves between city gate and West Salisbury. Fig. 7 (above) Detail of hookup*

6° as a safe deflection angle, which provided a factor of safety of 3⅓. For purposes of computation we assumed that each pipe length would become a chord of a circle subtending a central angle of 6°. Solving for the length of such a chord in accordance with the curve assumed and shown in Fig. 1 we found it to be 10½ ft. Our decision, however, was to use 10-ft. lengths of

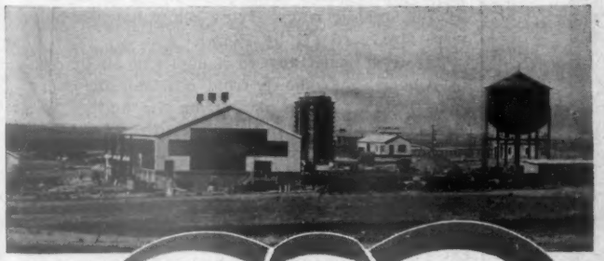
# PITTSBURGH·DES MOINES

## INDUSTRY'S LEADING BUILDER OF

# PIPE LINE BRIDGES



*2640-foot Pipe Line Suspension Bridge over the Missouri River near Sioux City, Iowa—one of many projects completed by the Pittsburgh-Des Moines Steel Company.*

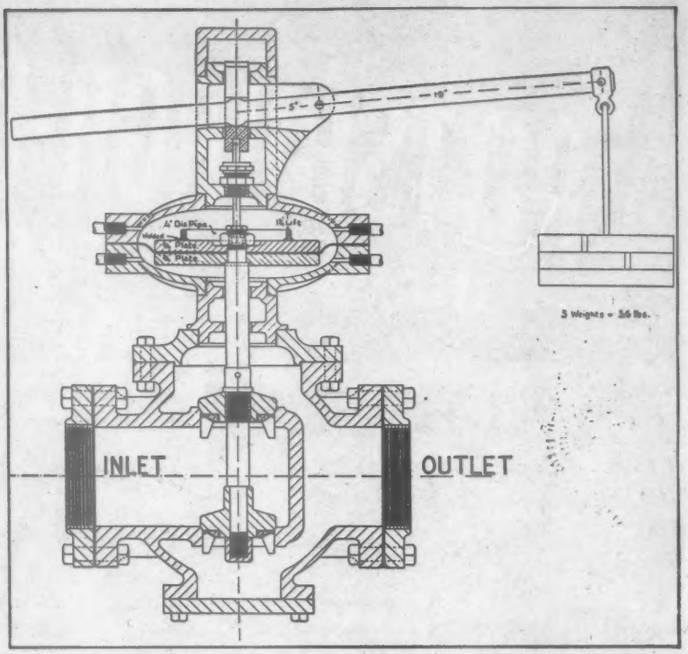


*Compressor Station Buildings are also designed and constructed by this experienced engineering organization.*

To the Natural Gas and Petroleum Industries the Pittsburgh-Des Moines Steel Company offers a "complete service" in the design and the construction of Pipe Line Bridges, Compressor Stations, and Tanks which consists of experienced field engineers, two modern shops for the fabrication of structural steel and tanks, the retained services of Consulting Pipe Line Bridge Engineers, and a construction organization highly qualified and experienced in the construction of all types of "pneumatic" and "open type" bridge foundations, pile driving; steel, cable, and tank erection. Present your construction problems to the Pittsburgh-Des Moines Steel Company.

**PITTSBURGH·DES MOINES STEEL CO.**

PITTSBURGH, PA., 3496 NEVILLE ISLAND—DES MOINES, IOWA, 997 TUTTLE STREET
DALLAS, TEX., 1201 PRAETORIAN BUILDING
NEW YORK, ROOM 980, 270 BROADWAY . . . CHICAGO, 1202 FIRST NATIONAL BANK BUILDING . SAN FRANCISCO, 603 RIALTO BUILDING
SEATTLE, 1106 EIGHTH AVENUE, SOUTH




*F.g. 8 (left) Upstream automatic valve. Fig. 9 (above) Differential regulator*

pipe. The elongation computed as above indicated amounted to a little over 6 in.

The next thing was to make sure that these pipes would not blow out at the couplings. To prevent this we decided to make use of Dresser harness couplings. The application of the use of these harness couplings is shown in Fig. 3. Four bolts are used at each joint, each bolt being connected to one lug which is welded to the middle ring and another lug which is welded to the pipe. It should perhaps be mentioned here that these middle rings were supplied with lugs attached. Two bolts diametrically opposite connect the middle ring to one pipe, and two bolts diametrically opposite and half way between the two other pair of bolts connect the middle ring to the other pipe. The effect of these harness couplings is to permit a satisfactory degree of universal-joint action at the Dresser. Two nuts are used on each bolt—the outer nut locking the inner nut so as to provide a play space of 1 in. This permits of 1-in. elongation on each side of the Dresser, or a total of 2 in. at each joint, but no more. Neither pipe can pull out of the Dresser. To allow for the possibility of a joint being in compression, a space of ½ in. was left between the end of each pipe and the center bead of the middle ring. The harness bolts were set on the circumference of the pipe midway between the vertical and horizontal axes of the pipe.

It will be noted from Fig. 3 that extra heavy middle rings were used to resist the stresses tending to distortion because of the use of the harness couplings. As previously stated, we used ⅞ by 7-in. middle rings. Extra heavy harness bolts were also used (⅞ by 13-in.).

The frost penetrates to a depth of about 6 ft. in Alberta. Subsidence from coal mining operations begins to take place from the bottom, and as successive layers fall down into the workings, the subsidence approaches the surface. Should the subsidence reach the underside of the frost slab in the wintertime a cavity would be formed at that point, the frost slab containing the pipe line acting as a beam. It was, therefore, felt that the pipe line should either be laid below the frost slab or above the ground. The latter course seemed to us to be more practical and, to protect the pipe from kicking about under pressure, it was decided to strap it down to concrete anchors, in the manner indicated in Fig. 4. These concrete anchors would, of course, subside with the surface and would therefore still perform their function by virtue of their weight, even though deflected slightly one way or the other. Fig. 5 shows a closeup view of this special construction.

### Automatic Upstream Valves

As a further precaution in case of one of our lines should fail as a result of the mining, we gave considerable thought as to what could be done in the way of automatically closing off that line. Of course, an ordinary swing check valve would do the trick downstream from the break.


# KENT

## *air-operated controllers*

have now been brought into line with the famous "KM" Meter. Controllers for temperature, pressure, flow and liquid level are similar in principle. Adjustable throttling over a wide range is provided in the proportional control, and the reset device gives full automatic control.

Special features are dial adjustment of sensitivity for both proportional and reset control and remote hand control of the valve.

These instruments are supplied for flush panel, wall or post mounting.

*Send for publication No. 880*

GEORGE KENT LTD., LUTON, BEDFORDSHIRE. LONDON OFFICE: 200 HIGH HOLBORN, W.C.I. *Agents:* MELBOURNE: George Kent (Victoria), Pty. Ltd., 395 Collins Street. PORT-OF-SPAIN, TRINIDAD: Davidson-Arnott & Co., Union Club Buildings. BUENOS AIRES, ARGENTINE: Evans, Thorton & Co., 465 Calle de Fenda.

**Save tear-down jobs and labor cost**

**Rust-Proof Your Well Machinery & Engine Cooling Systems For A Year**

## *Easy to Use . . .*

"NO FUSS—NO MUSS
JUST POUR—NO MORE"

If your well is idle, the cooling system on motors and engines rusts faster than normally. So rust-proof your cooling system at all times . . . it eliminates tear-down job, also eliminates tying up of equipment when it is needed.

Excellent for removing scale caused from lime gyp and hard waters from radiators on pumping engines, drilling engines, truck and tractor engines and well servicing unit engines.

RUST MASTER has been tried and proved in the automotive field for many years—sold and used by national fleet operators such as Greyhound Lines, many Yellow Cab corporations, oil companies, public utilities and other national fleet operators.

**Proof? Here it is ↓**

**GULF SUPT.-Kilgore, Texas says:**

We found that when we first started using Rust Master in pint cans that it saved us 65% on our total repairs on our stationary motors in the East Texas field, so then in order to have it on hand we purchased it in drum lots
It saved us tear-down jobs and increased the efficiency of our motors during the last three years. I will be glad to recommend Rust Master after many years of trouble and wide experience with all kinds of motors

Gulf Oil Corporation
Kilgore, P. O. Box 72
W. V. Chapman.
W. V. Chapman

***Bulletin information available on request***

***Use Six Master for cleaning out gum and carbon-sludge from inside of motor and Leak Master for eliminating leaks in radiator systems.***

***Ask Your Jobber or Supplier***

Rust Master Chemical Corporation
712 BEACON STREET, BOSTON, MASS.
"THE SILENT PARTNERS OF MOTOR EFFICIENCY"


We had never heard of an upstream automatic check valve, but it seemed to us that it ought to be possible to devise one. We were to have two lines about 57 ft. apart, normally carrying equal pressures. It seemed to us that it should be possible to employ the difference in pressure, which would be set up by a break in one of the lines, to shut off the broken line. We found that this could be done by installing a special high-pressure differential regulator in each line in the manner shown in Fig. 6, which shows diagrammatically our transmission system between West Salisbury and Edmonton, a distance of about 5¼ miles. It will be noted that swing check valves are installed in each line just outside our city gate station at *F* and *G*, and that in each line at West Salisbury there is an upstream automatic valve and hookup as shown in detail in Fig. 7. It should be noted that the pipe leading to the inlet of the valve hookup is carried above the extension of the main to a dead end. This is so that any stones or other foreign matter will be carried straight ahead to the dead end instead of into the inlet of the valves where they might cause damage to the valve seats. A photograph of the interior of one of the valve houses at West Salisbury is shown in Fig. 8. It can be seen from either Fig. 6 or Fig. 7 that the pressure of the pipe line in which the regulator is installed is carried to the underside of the diaphragm and that the pressure above the diaphram comes from the opposite pipe line. Therefore, this is what would happen in the case of a break at point *E* (Fig. 6). Swing check valve at *F* would close as soon as the gas commenced to flow towards *E*. Pressure in the line at *C* would fall, becoming less than at *J*. When this difference amounted to something of the order of 1½ lb. per sq. in., this differential acting on the top of the 13-in. diaphragm in the regulator at *B* would be sufficient to overcome the effect of the weighted lever arm (Fig 8 or Fig. 9) and thus the valve would close.

Our plans were submitted to Chaplin-Fulton Co., and we are indebted to them for their co-operation in working out some of the details. We had on hand two 10-in. special high-pressure differential regulators equipped with 13-in. diaphragms but the diaphragm plates were only ¼ in. thick. Chaplin-Fulton Co. carried out a test and found that a diaphragm plate of this size bent under a pressure of 100 lb. They tried a ¾-in. plate, which satisfactorily withstood a pressure of 300 lb. before bending. Our maximum working pressure at the point concerned is about 200 lb. To meet the conditions under which these regulators might have to operate, it was decided to install a ¾-in. plate both below and above the diaphragm, as shown in Fig. 9. It will also be noted that a collar was installed above the upper diaphragm plate to act as a stopper to prevent bending of the light upper steel stem. This collar was cut out of a section of 4-in. pipe and spot welded to the upper diaphragm plate.

The operation of these valves has been frequently tested with very satisfactory results by the opening alternately of the 4-in. bleed valves at *L* and *M* (Fig. 6). The automatic valves at *B* and *K* have been found to close in something of the order of 40 to 60 seconds after the opening of the respective bleed valves. These bleed valves and automatic upstream valves are 5¼ miles apart.

It has been necessary for us to keep ourselves constantly informed of the underground workings of the mine so that we could install more of the special type construction described in this article in advance of the time when such subsidence might occur. The methods adopted have proved very satisfactory. In this connection, last fall 400 ft. of our 12-in. line dropped a fairly uniform vertical distance of about 2½ ft. The pipe line stood the test, no leakage whatever developing from this considerable disturbance of the surface.

**MORE PRECIOUS THAN *PEARLS***

All the pearls in the world couldn't stop a blitzkrieg. It takes mechanized equipment, and that means oil—plenty of oil!

Ludlow Valves are doing heroic duty in aiding delivery of America's oil. In pipeline, oil field and refinery operations, they're giving smooth, trouble-free service under the most severe conditions. Operating on the famous double-disc, parallel seat principle, developed and perfected by Ludlow, these rugged valves work smoothly, close securely—even after years in the open position. In emergencies or otherwise, Ludlow means value in valves. Send for catalog.

THE LUDLOW VALVE MFG. CO., INC.
TROY, NEW YORK

*Construction Features:* Self-releasing 30° angle wedges and free-floating gates, self-adjusting to seats, afford smooth, trouble-free performance, long service. Rings are cleaned throughout stroke action. Gates are wedge-locked directly opposite ports and completely unwedged before raising. Ample tolerances provide easy action. Simple construction permits easy replacement of parts.

**LUDLOW VALVES**

SINCE 1866

# Prairie Partner OF THE FLYING FORTRESS

Lonely landmark of a vast underground network of oil pipe lines, the pumping station stands as a vital link in America's oil transportation system. Like a pulsing heart its diesel engine keeps the nation's life blood flowing, night and day, toward coastal areas where, without this precious resource, planes and ships would be bound to earth and shore, war industries and workers reduced to ineffectiveness.

First oil engine to be placed in trunk pipe line service was a De La Vergne. This was in 1907. First in the entire petroleum industry was a De La Vergne in 1905. These engines were the pioneers of hundreds of diesels, now built by Baldwin, which are providing the pipe lines with proven, dependable power.

Based on years of experience in this specialized service, De La Vergne engineers have developed diesel engines for every oil pipe line job. Dependable De La Vergne diesels are built in sizes ranging from 200 b.h.p. to 1,500 b.h.p.

BALDWIN

*De La Vergne*

SALES CORP.

BLW THE BALDWIN GROUP

SUBSIDIARY OF THE BALDWIN LOCOMOTIVE WORKS • PHILADELPHIA

# Station Operation Departs From Many Customary Practices

By M. A. HYDE
Industry Engineer, Petroleum & Chemical Section,
Westinghouse Electric & Manufacturing Co.

THE world's largest pipe line for refined petroleum products and a vital link in the nation's wartime transportation system has been placed in service. This 1,261-mile line of the Plantation Pipe Line, from Baton Rouge, La., to Greensboro, N. C., established several new records. The first full-length delivery through the line was made in the incredibly short time of 180 days after the first trench was dug. Not only is this the largest electrically powered pipe line, but electricity played a vital part in its rapid construction. In 1 week 111 miles of 10 and 12-in. pipe was electrically welded. The 39 pumps in the 16 stations are driven by explosion-resisting induction motors, some of them the largest of their type ever built. Furthermore, these motors have two horsepower ratings, one 50 per cent larger than the other, either obtainable simply by changing the blower. Efficiencies at the two ratings differ by only a small fraction of 1 per cent.

Receipt of products at Baton Rouge, La., is scheduled weeks in advance, and the scheduling of shipments and deliveries over the line is worked out according to carefully prepared plans. Many times eight products are in the line at once.

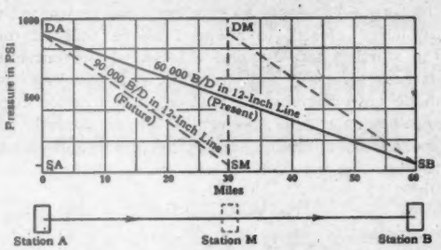



*Fig. 1—Pressure gradients in level section of 12-in. line. SA is the suction pressure at initial station A, DA discharge pressure at this station, and line DA-SB the pressure gradient along some 60 miles of lines from station A to station B, for a flow rate of 60,000 bbl. of gasoline per day. This flow can be carried by line under conditions prescribed*

Deliveries of these products must be made at as many as 17 different points, and some of these points require separate shipments to three different marketing companies. Deliveries may be at one point at a time, or multiple deliveries may be made simultaneously at several points on the system. Consider, too, that this system is not a single straight, uniform pipe line, but consists of a short section of four parallel 12-in. lines to a storage tank farm and the initial station of the pipe line proper; a 12-in. section of main line to a midpoint at Bremen, Ga., thence a section of 10-in. main line to Greensboro; also, four smaller branch lines, 8-in. and 4-in., one of which, in turn, is branched.

This complex and ever-changing dispatching function for the entire line is centralized in a dispatcher's office in Atlanta. All pumping stations and delivery points are connected to the dispatcher's office by a teletype system providing continuous recorded intercommunication. From the dispatcher's office are issued all orders governing the routine operations of the line, including starting and stopping of stations and units within the stations.

One of the critical features of multiproduct-line operation is the prevention of intermixture of different successive shipments (called "tenders") as they move end-to-end through the line and the pumping stations. To accomplish this it is necessary to maintain velocity in the line higher than a critical minimum amount. At any lower velocities a phenomenon akin to laminar flow takes place, with greatly increased intermixing. Obviously this places an unusual premium upon reliable operation of the pumping equipment.

At any station, the time of transition from one tender to the next can be predetermined within a few minutes from the data available in the dispatcher's office. Exact determination at the station itself is by change in the color of successive differently colored tenders, by the passage of a small quantity of dye interposed between the two tenders, or by a continuous graphic record of specific gravity of the tenders obtained by a highly sensitive gravitometer. This instrument consists essentially of a spherical weighing chamber, of exactly known volume, through which is

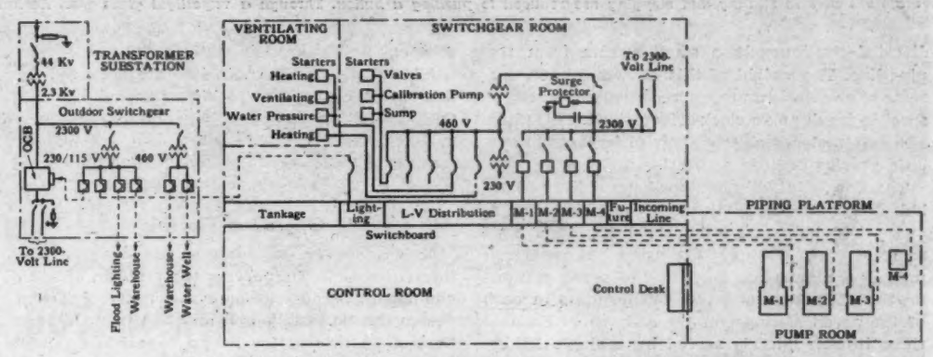
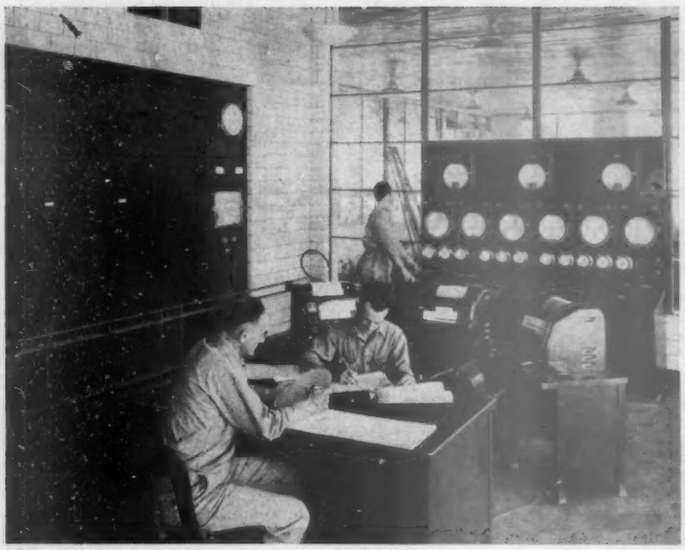



*Fig. 2—Schematic diagram of station layout and electrical circuits*

*Fig. 3 (Left)—Some of the largest explosion-resisting motors ever built drive the pumps that push the petroleum products through the 1,261-mile line. Fig. 4 (Right)—A "paper pipe line" guides the complicated dispatching of several "tenders"*



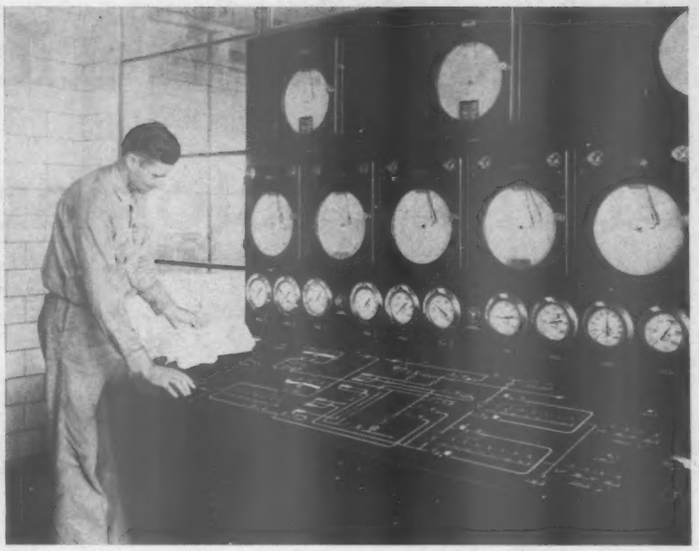


*Fig. 5 (Left)—Control room in station serving main-line and two branches. Teletypes are in center, switchboard at left and control board in right background. Fig. 6 (Right)—The control board reveals rates of flow, pressures at critical points, motor loads, and temperature of motor and pump parts. Lights indicate valve positions—green closed, amber open. Red lights identify protective shutdown functions. Lights and control switches are arranged in appropriate position in a miniature layout of station piping. Operators' duties in starting and stopping are reduced to pushing a button. Through a vaportight glass wall he has full view of the pump room*

diverted continuously a small stream from the pipe line. The weight of this known volume, corrected for temperature, is recorded in terms of specific gravity on a clock-driven chart. This ultrasensitive meter is able to show differences in specific gravity as little as 0.002.

The line as initially equipped can deliver 60.000 bbl. of gasoline daily through the 12-in. section, and 42,000 bbl. through the 10-in. section. This requires two 600-hp. 3,600-r.p.m. motor-driven main-line pumps for each of the seven stations on the 12-in. line, and two 450-hp. units in each of the seven stations on the 10-in. line. Each of three branch lines is served by a single 150-hp. unit, while the fourth has one of 450-hp. at its origin plus an additional booster station with a single 450-hp. motor and pump. The unloading station at Baton Rouge dock contains five 600-hp. units, providing ample capacity for rapidly unloading tankers and barges. The initial main-line station at Baton Rouge tank farm contains a complete spare pump and drive to insure the availability of two units there at all times.

The maximum operating pressure is approximately 900 lb. per sq. in. in the 12-in. section and 975 lb. in the remaining sections. These pressures are fixed by the allowable stress in the pipe, which in turn is a matter of design economics. If the minimum allowable suction pressure at each station is established as, say, 40 lb. then with a maximum allowable station discharge pressure of 900 lb., the pressure increment introduced into the line at any station is 860 lb., plus the pressure loss through the station piping. The stations are so spaced, then, that the pressure drop between stations resulting from fluid friction at rated flow, plus the static pressure differential totals approximately 860 lb. Between the discharge of one station and the suction of the next, with uniform pipe, there is a uniform decrease in the component of total pressure due to line friction, this pressure drop being directly proportional to the distance from the upstream station.

A second series of intermediate pressure increments may be added, as shown. For the line in question, this flow rate for gasoline is calculated at approximately 90,000 bbl. per day. Establishing this higher flow rate means increasing the horsepower input at the existing stations from two 600-hp. to two 900-hp. units and likewise equipping the new stations.

All stations on the main line are arranged for this future changeover to higher capacity by initially installing pumps of such design that new impellers can be readily substituted and motors, control, and switchgear designed for ultimate operation at the increased horsepower.

## Operation Flexible

Motors 450 hp. and above are mechanically interchangeable, simplifying the problem of spare equipment, because a spare motor of 600/900-hp. design can be installed on any line pump unit in the system (except the 150-hp. branch-line units). This feature also provides maximum utility of the equipment under unpredictable future alterations that result from changed operating conditions.

Although the line is designed for a certain rated capacity, consideration must be given also to its flexible and economical operation at reduced deliveries. It is desirable, from the standpoint of power consumption, to operate between the minimum rate permissible from the standpoint of contamination and the full capacity of the line, at a rate as low as will suffice to meet the transportation schedules.

Motors of the constant-speed type are preferred because they are simpler and more adaptable to construction for hazardous atmospheres. Installation of two units per station, operated at constant speed, with the pumps connected in series, provides the required degree of flexibility. With this arrangement, and with all stations along the line having piping installed to permit bypassing any unused unit or station, changes in flow in steps of a few per cent can be made by operating both, only one, or no pumps in properly selected stations.

## Motors Started With Minimum Power

Most stations contain two main pumps comprising 95 per cent of the station load. The motors are built with low rotor resistance. Although this results in low starting torque, it gives high operating efficiency. Because of the high load factor at which this system will operate, efficiency is important. To minimize current peaks during starting, motor starters for all units of 450 hp. and larger are of the autotransformer type, with closed-circuit transition. During the brief interval when the motor is transferred to full voltage with its terminals still connected to the starting tap, a reactor between the autotransformer tap and the motor limits the current in the autotransformer circuit. By suitable control this reactor also provides an additional reduced-voltage starting step when power is first applied.

While starting, the voltage at the motor terminals is sufficient to enable the motor to develop the torque necessary to accelerate the pump, with discharge closed, to a speed above pull-out on the starting tap. Beyond this speed the current decreases rapidly and transfer to full voltage is made on a low-current portion of the motor current-torque curve. Acceleration occurs directly as the excess of motor torque beyond pump input torque and inversely as the total inertia of the unit.

To minimize the motor torque during starting, the discharge valve of the centrifugal pump is closed. Starting must be accomplished within a reasonable time, a limit of 30 seconds being established as desirable by considerations of heating of the fluid within the pump casing. After the unit is up to speed the valve is opened slowly so that the change in direction of flow through the station piping will be gradual, for well-known hydraulic reasons.

## Station Design

In the pump room and on the adjoining piping platform, petroleum vapors may be present during certain phases of station operation. Anticipating these conditions, and to provide adequate cooling air for the motors, the pump room is ventilated by air drawn through filters in the front wall of the station. This air is forced through the motor frames by the motor blowers and discharged toward the rear wall of the pump room. In this wall, just below the ceiling, are mounted one or more motor-driven exhaust fans that discharge the air onto the piping platform. The piping platform is open on three sides with a flat roof for weather shelter, a construction affording maximum natural ventilation. The piping platform and pump room are at ground level. Trenches and other depressions favorable to accumulating hydrocarbon vapors are strictly avoided.

All electric motors, control, signal devices, motor-operated valves, lighting fixtures, and wir-

*The Wailes Dove-Hermiston machine being used on 50 miles of 26" O.D. natural gas pipe for the Natural Gas Pipeline Company of America.*

## . . . with the NEW WAILES DOVE-HERMISTON LINE TRAVELING, PIPE COATING AND WRAPPING MACHINE

THE WAILES DOVE-HERMISTON CORPORATION new Line Traveling, Pipe Coating and Wrapping Machine incorporates many new and radical improvements, developed after years of research.

A sump tank underneath the machine contains the hot Bitumastic Enamel which is pumped into an annular ring surrounding the pipe. The Enamel, emitted under pressure from holes in the inner face of the ring, floods the pipe uniformly on all surfaces. Supplementary orifices apply an extra coating to a large portion of the bottom of the pipe.

The machine is compact and sturdy, and is self-propelled on the pipe—uphill and downhill and around bends—as fast as the pipe can be laid.

The principal advantages of the machine are:

The coating thickness is uniform on all surfaces of the pipe.

The minimum amount of coating material is required for any specified thickness.

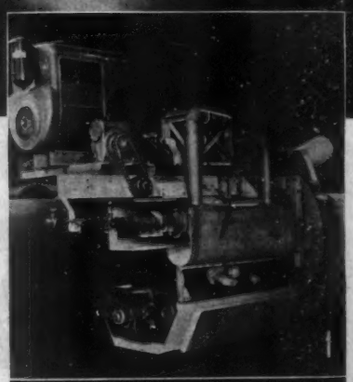
Double coating the bottom assures full thickness where the pipe is exposed to corrosive soil waters in the bottom of the ditch.

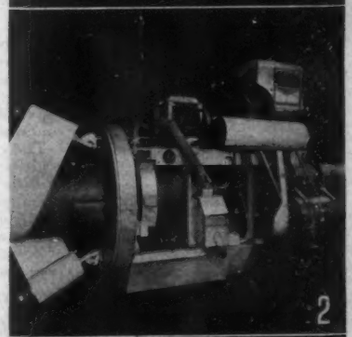
Holidays are practically non-existent, thereby reducing touch-up expense to a minimum.

Vital parts of the machine are kept at a temperature of about 600° F. This enables the machine to start coating operations without delay.

No moving parts are in contact with the pipe during or after the coating application. No defects due to scraping can occur in the coating under the wrapper.

The machine is so sturdily constructed that delays from serious breakdowns are improbable.


1


2

3

**1** *Side view, showing heating furnace and sump tank.* **2** *Side view, showing wrapping attachment at left.* **3** *Rear view, showing apron to drain drippings back into sump tank.*

WAILES DOVE-HERMISTON CORPORATION

WESTFIELD NEW JERSEY

NEW YORK • PHILADELPHIA • CLEVELAND • CHICAGO • HOUSTON • TULSA • SAN FRANCISCO • LOS ANGELES • MIAMI

ing installation in this area are specifically designed for service in atmospheres containing petroleum vapors (Class 1, Group D).

The 600/900-hp. motors on the 12-in.-line pumps are the largest explosion-resisting motors ever built. Attainment of this rating in a relatively compact unit—an important consideration in explosion-resisting design—is accomplished by the circulation of large volumes of cooling air through the motor frames and by the use of Class B insulation with the motor rating based on 75° C. rise. All main-line pump motors have sleeve bearings, oil-ring lubricated and cooled by air blast from the motor ventilating fan. These bearings require no oil-circulating system, consequently each motor is an entirely self-contained unit without external accessories.

Nonhazardous atmospheric conditions are maintained in all parts of the pumping-station building, except the pump room and piping platform. No direct passageway connects the operating portion of the building and pump room. It is necessary to pass through outside entrances in going from one to the other. The atmosphere in the operating section is maintained safe by drawing outside air into the building at the end farthest from the pump room, and maintaining it at a slight pressure above the outside air and above the atmosphere in the pump room. Any air seepage through the wall separating the operation section from the pump room or piping platform will be toward the pump room instead of from it.

In view of these provisions, all control apparatus is of open design dead-front construction. This has the outstanding advantage of accessibility; inasmuch as the several stations on a pipe line operate in series and interdependently, it is imperative that during operation of the line any inspection and maintenance work on electrical equipment be performed without shutdown, or, in emergency, with the least possible shutdown time.

If the control-room atmosphere should become hazardous because of an equipment failure, the entire station can be safely shut down by pushing an emergency button. This trips the outdoor circuit breaker at the origin of the underground power feeder serving the station from the power substation. While the station operator can clear all power circuits within the station proper, the station lights and outside auxiliaries can be left in operation if required.

### Control System

Starting and normal stopping of the stations and of units within each station are controlled by the station attendant. Protective shutdown of units and stations is instituted automatically when conditions arise that exceed predetermined limits of safe operation, whereupon an audible signal is given, supplemented by light indication of the specific protective function that caused shutdown.

The duties of the attendant incident to the starting and stopping of main-line units are simplified by providing automatic operation in one complete sequence for the valves, motor control, and pressure devices concerned. The operator, thus relieved from performing a routine of manual operations at different points in the station, can devote his attention to the over-all process and to the results obtained.

For continuous operation of the line it is, of course, necessary to maintain pressure conditions within the limits predetermined for protective shutdown, and this is accomplished by automatic means.

The control system developed to meet these requirements embodies the coordinated application of pressure, temperature, and electrical control and indicating devices.

Each pump unit normally is controlled entirely from an individual "start-stop" pushbutton, the control system providing the proper sequence of starting and shutdown operations. Considering a typical two-unit booster station, this control system provides automatic means for:

1. Venting the pump casings during shutdown to prevent building up of pressure within them by leakage past suction or discharge valves.
2. Permitting the starting of a unit only upon existence of a predetermined minimum suction pressure.
3. Operating in correct sequence a motor-driven suction valve and a motor-driven discharge valve for each unit.
4. Venting vapor from the pump casing, and circulating liquid through the pump, during starting.
5. Adjusting the station capacity to the line throughput while the station is on the line.
6. Limiting the minimum value of station suction pressure to a value safe for pump operation.
7. Limiting the maximum value of the station discharge pressure to a value safe from the standpoint of pipe-line stress.
8. Safety shutdown, sounding the station alarm and lighting an individual indicating light, in case of excessive duration of high motor starting current, high temperatures at motor and pump bearings, pump glands and pump casing, low or high pump suction pressure, low or high station discharge pressure.
9. Alarm and individual light indication for high motor-winding temperature, high sump-tank level, low station air supply pressure, and low air supply pressure to hydraulic controllers.
10. Station pressure control. The regulation of station pressure is accomplished by air-actuated instruments of such a nature that the station suction and discharge pressures can be automatically maintained at any predetermined amount.

*(Continued on Page 177)*


STOP LOSSES

FROM CORROSION AND THERMAL SHOCK

IN EQUIPMENT DESIGNED FOR THE PRODUCTION OR USE OF

*Hydrochloric Acid*

BY USING NATIONAL® AND KARBATE®* TRADE-MARK TRADE-MARK

CARBON AND GRAPHITE MATERIALS

FOR THE CONSTRUCTION OF PROCESSING UNITS

● Carbon, graphite and "Karbate" materials are used in the construction of equipment for all processes involved in the manufacture or use of hydrochloric acid. This includes absorbing, cooling, rectifying, boiling and condensing units, conveying and circulating systems, vats, tanks and other containers.

These materials are resistant to the action of hydrochloric acid in all phases and concentrations. The excellent heat transfer properties of graphite base materials are of advantage in equipment used for heating, cooling and stripping processes. Good mechanical strength, exceptional resistance to thermal shock, ease of machining, and availability in a wide variety of forms adapt these products to the fabrication of practically any desired type of processing equipment.

EXPERIENCE HAS PROVED THE DURABILITY OF CARBON AND GRAPHITE MATERIALS IN THE PRESENCE OF HYDROCHLORIC ACID AND THE ECONOMY RESULTING FROM THEIR USE

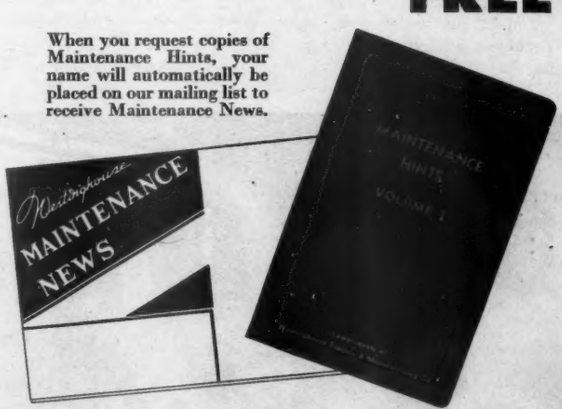
WHATEVER YOUR PROBLEM, CONSIDER CARBON AND GRAPHITE *Write for Information*

* The words "National" and "Karbate" are trade-marks of National Carbon Company, Inc. The trade-mark "Karbate" identifies a line of carbon and graphite base materials impervious to seepage of liquids and gases under pressure.

NATIONAL CARBON COMPANY, INC.
Unit of Union Carbide and Carbon Corporation
UCC
CARBON SALES DIVISION, CLEVELAND, OHIO
General Offices: 30 East 42nd St., New York, N. Y.
Branch Sales Offices: New York • Pittsburgh • Chicago • St. Louis • San Francisco

# FREE

When you request copies of Maintenance Hints, your name will automatically be placed on our mailing list to receive Maintenance News.




## HINTS ON HOW TO MAINTAIN ELECTRICAL EQUIPMENT

Continuous output depends on proper maintenance. This book will help. Thousands of maintenance men are already using it. Gives timely tips on the care and maintenance of electrical equipment.

Fill in this coupon now and mail it today. When we receive your request your name will automatically be placed on our mailing list to receive Westinghouse Maintenance News—another free publication for maintenance men, issued periodically to give latest news on maintenance methods.

Westinghouse Elec. & Mfg. Co.,
East Pittsburgh, Pa., Dept. 7-N
Maintenance Sales Dept.:
Please forward copies of Maintenance Hints, to:

_____

_____

Company _____

Address _____

City _____ State _____

By _____ Title _____

J-94529

**TIME-SAVER FOR THE PETROLEUM INDUSTRY**

# Centrifugal Pumps Are Widely Used in Pipe-Line Service

By FRANK R. YOUNG
Consulting Petroleum Engineer

REVIEWING the comparatively short history of centrifugal pumps and their rapid rise to present importance, we find that practically the whole development of the modern centrifugal as we know it today has taken place since 1920. Furthermore we find there were two factors responsible for the improvement and advance in centrifugal pumping, firstly, the development of the multistage pump and secondly, the increase in speed resulting from the introduction of the two-pole motor. Without these two factors we would not be using high-pressure centrifugals as we are today.

The whole subject comes down to a matter of lower costs, which is just another way of saying increased efficiencies, for of course, increased pumping efficiencies mean lower costs. By the introduction of the multistage pump around the year 1920, high-pressure centrifugal pumping was introduced and somewhat later along came the two-pole high-speed, 3,600 r.p.m. motor which satisfied the final requirement, economical efficiency, thereby making the present day centrifugal possible.

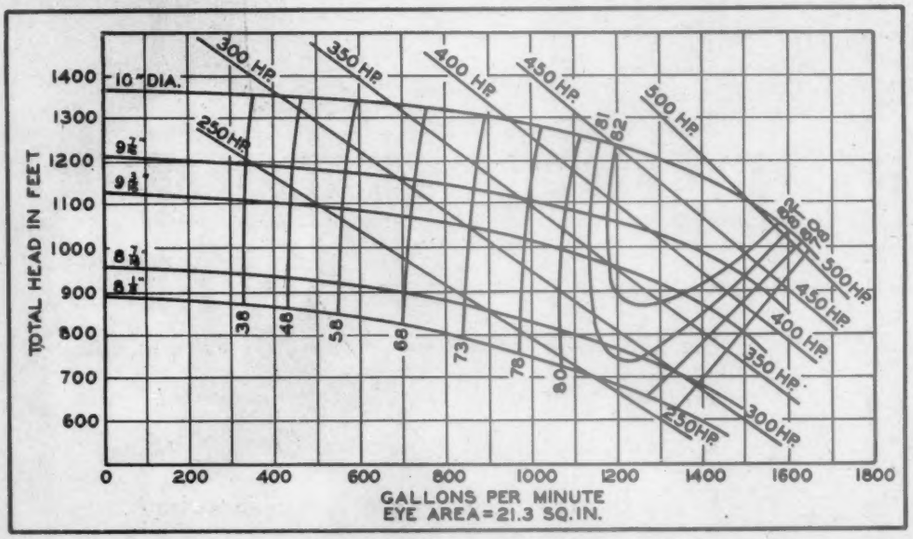



*Fig. 1—Head-capacity curve of 6-in. by 8-in. three-stage pump with varying runner diameters and with corresponding capacities, heads and horsepower requirements*

### Efficiency of Centrifugal

The modern centrifugal is an excellent machine, representing as it does, the absolute, irreducible minimum in pumping machinery and material. With only one moving part, lightness, compactness, and little to wear out, the ideal in mechanical excellence is attained and for this excellence we have to thank the development of the multistage principle plus the high-speed two-pole motor.

Centrifugal pumps may be and are, of course, driven by prime movers other than electric motors but the ultimate in economy, safety, and general satisfaction is achieved by the use of a centrifugal pump direct connected to an electric motor.

The multistage pump is the logical development of the simple problem of boosting water stage by stage up a hillside. Early drawings of centrifugal pumping show diagrams of several single-stage pumps, boosting up hill to the next pump and so on to the top. When some engineer conceived the idea of hooking these several pumps together on one foundation, then the multistage pump was born. Low efficiencies in the early models retarded their wide acceptance, but when speeds were increased and internal friction reduced, efficiencies jumped up, until now efficiencies up to 90 per cent or even higher are standard merchandise.

Centrifugal pumps can be broadly classified into three types.

1. Volute pumps in which a volute or spiral-shaped cone surrounds a rotating impeller.
2. Guide vane or turbine pumps where the liquid being pumped leaves the tips of an impeller and enters the vanes of a diffuser.
3. Combination of the two above types.

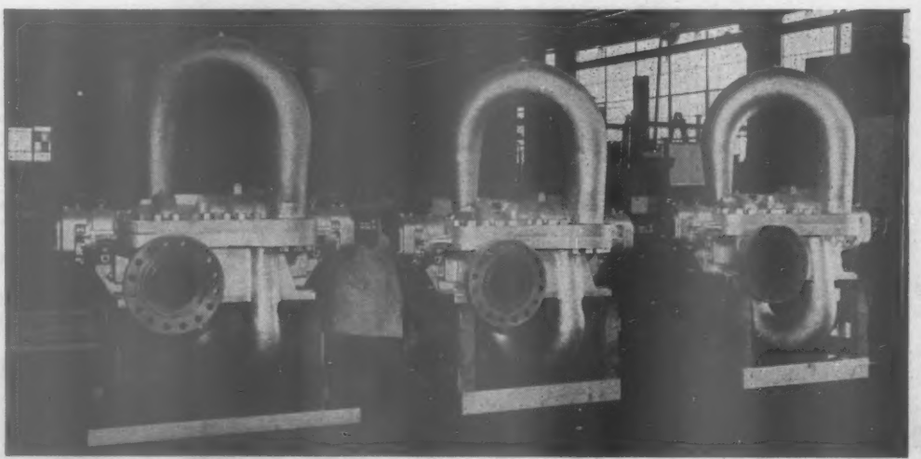
In all cases, pressure energy is obtained by rotation of an impeller when the liquid enters the eye or center of the impeller and is pushed outward by the runner vanes. The kinetic energy developed is largely converted into pressure energy by the uniformly increasing area of the volute casing or by the diffusing vanes which are designed to prevent the dissipation of the kinetic energy.

### Pump Size in Inches

Pump manufacturers designate their pumps, as a rule, by a certain size in inches, which is the dimension of the discharge nozzle diameter. This is far from being a characteristic figure but is used because it is an easily measurable dimension. Performance curves or so-called "head-capacity" curves are developed for the different pumps and latterly, manufacturers are showing on one curve, the different characteristics for various recommended impeller diameters. (See Fig. 1.)

So far as the mathematical principles underlying centrifugal-pump performance are concerned, this writer can testify they are somewhat arduous and complicated. Pump designers have arrived at their present excellence partly by progress in theory but mostly by experience. The introduction of the conception of "specific speed" for pump classification has provided a scientific basis for systematizing and evaluating the accumulated experiences and knowledge which has enabled engineers to interpolate between existing types of pumps and also indicated the realms for development of new types.

*(Continued on Page 166)*



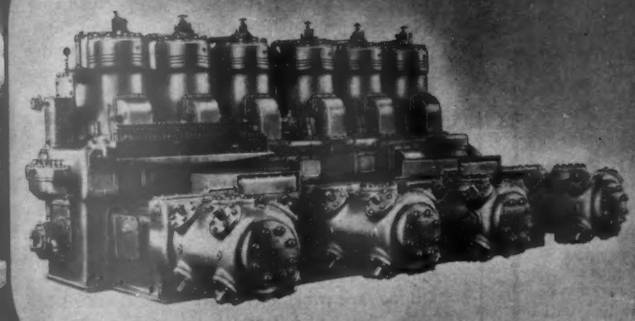
*Showing 6-in. by 10-in. three-stage pumps with stages connected by large volute crossovers which reduce internal pump friction*

# SINCE 1924

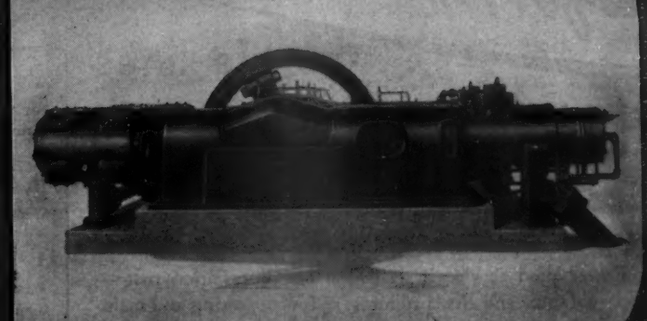
CLARK takes pleasure in extending congratulations to the Phillips Petroleum Company on the occasion of the 25th Anniversary of its founding. Sound judgment and aggressive policies have made the Phillips Company, in the short period of 25 years, one of the world's leading fully integrated oil companies, with large operations in all branches of the industry —producing, transporting, research, refining and marketing.

Eighteen years ago, in June, 1924, Phillips placed with Clark Brothers its first order for CLARK Compressors. Since that time Phillips has been a large and regular customer of our company, having ordered and installed many batteries of CLARK Compressors, both horizontal and "Angle" types, for gasoline plant, refinery, pressure maintenance and pipe line service. A number of these installations rank among the world's largest in their respective fields. The accompanying photo montage shows a few Phillips Compressor Plants.

The patronage of such leaders as Phillips is directly attributable to Clark's leadership in the 2 cycle engine field. Years ago, recognizing the unequaled simplicity and sturdiness of the 2 cycle design, Phillips Petroleum Co. and Clark Bros. set out to perfect the 2 cycle engine. Their pioneering has been responsible for the development of the fuel injection system and other basic improvements which, while preserving the great advantages of 2 cycle simplicity, have increased power output and bettered performance to exceed that of the best 4 cycle engines.



CLARK 6-Cyl. 600 H. P. Gas Engine Driven "Angle" Compressor



CLARK 250 H. P. Gas Engine Driven Horizontal Twin Compressor

CLARK BROS. CO., INC., Olean, N.Y. Export offices: 30 Rockefeller Plaza, New York. Domestic Sales Offices and Warehouses: Tulsa, Okla.; Houston, Tex.; Chicago, Ill. (122 S. Michigan Ave.); Boston, Mass. (131 Clarendon St.); Huntington Park, Calif. (5715 Bicket St.); Foreign Offices: 72 Turnmill St., E. C. 1, London; Avda Roque Saenz Pena 832, Buenos Aires.

CLARK

*(Continued from Page 162)*

The formula for the calculation of specific speed ($N_s$) is:

$$N_s = \frac{N\sqrt{Q}}{H^{3/4}}$$

In which:

$N$ = r.p.m.
$Q$ = g.p.m.
$H$ = head in feet.

Specific speed is defined as the speed in revolutions per minute as which an impeller geometrically similar to the one under consideration and reduced in size develops a head of 1 ft. and a capacity of 1 g.p.m. It is seen then that specific speed is merely a type characteristic and is one form of criterion characterizing the operation of centrifugal pumps.

The predetermination of the performance of a pump at different speeds or similar pumps of different sizes is based on the use of "affinity laws" established first experimentally for hydraulic turbines. The term "affinity law," designates the following relationships between head, capacity, speed, and power.

1. Capacity varies directly as the speed or diameter of impeller.

2. Total head varies as the square of the speed or diameter.

3. Brake horsepower varies as the cube of the speed or diameter.

Expressed as equations, these are:

$$(1) \qquad GPM_2 = GPM_1 = \left(\frac{RPM_2}{RPM_1}\right) \qquad \text{or,}$$

$$GPM_2 = GPM_1 \left(\frac{d_2}{d_1}\right)$$

$$(2) \qquad H_2 = H_1 = \left(\frac{RPM_2}{RPM_1}\right)^2 \qquad \text{or,}$$

$$H_2 = H_1 \left(\frac{d_2}{d_1}\right)^2$$

$$(3) \qquad BHP_2 = BHP_1 = \left(\frac{RPM_2}{RPM_1}\right)^3 \qquad \text{or,}$$

$$BHP_2 = BHP_1 \left(\frac{d_2}{d_1}\right)^3$$

The impeller diameter changes considered in the above formulas are for slight changes in diameter, as for example, the effect which an increase or decrease in impeller diameter would have on an existing pump. For larger cuts the head and capacity will decrease faster than these rules.

Designers have developed many ingenious formulas from specific speed, affinity laws, and dynamic similarity of centrifugal pumps which

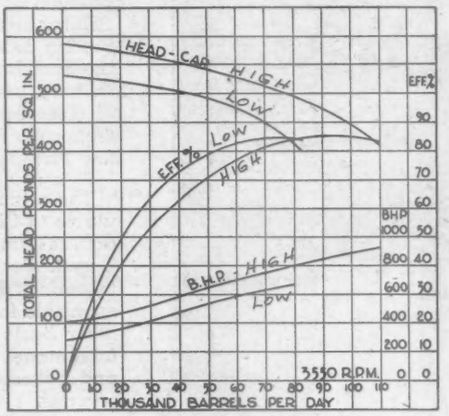



***Fig. 2—Performance curves with 8-in. by 10-in. three-stage pipe-line pump with high and low capacity impellers for Plantation Pipe Line Co.***

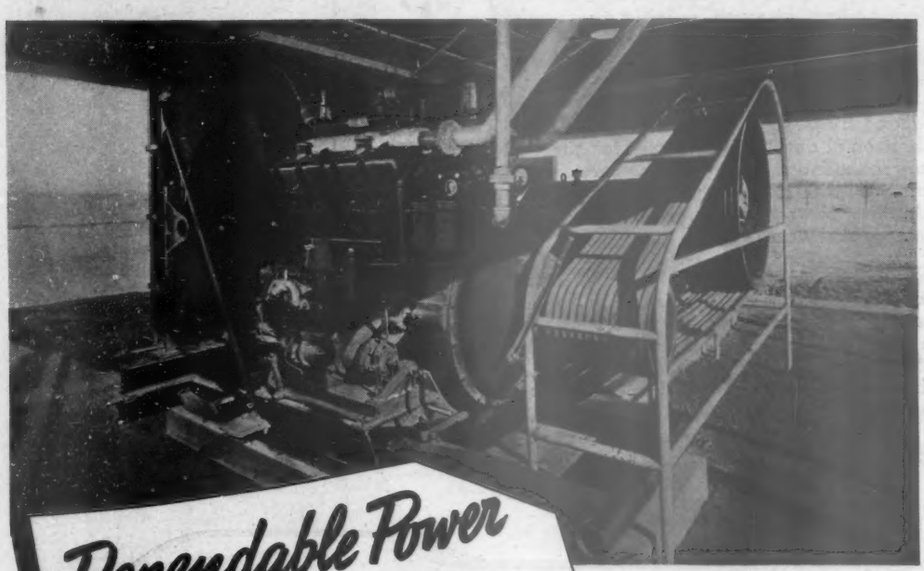
will not be discussed in this paper. There are, however, several aspects of pump performance which are of legitimate and most practical interest to operating engineers and which are reducible to ordinary mathematical considerations. These aspects concern the changes in operation resulting from different speeds, different impeller diameters, and the effect which these two have on the horsepower.

### Large Savings Effected

For example, the matter of changing impeller diameters can be of considerable economic importance in cases where existing centrifugal installations are working under conditions different from those under which the pumps were installed. Reducing pressures by cutting down the impeller diameter can and has effected large savings in power costs when the original high pressures were no longer needed.

An oil or gasoline trunk line operated by modern centrifugal pumps represents the minimum in transportation costs. But these operations, particularly in some of the older lines, should be reviewed periodically as engineers may find a fertile field for economics by studying present requirements of capacities, time of operating, and pressures. Anything which can be done towards reducing pumping pressures through rearranging schedules and pumping over longer periods of time, may be suspected of containing important savings.

When it is recalled that friction pressure loss in pipe lines is increasing nearly with the 1.75 power of the capacity, then the lowest rate and pressure of pumping to transport the required

Dependable Power for Pipe Lines

Auxiliary pumping unit powered with Le Roi RX1V engine. Installed in a main pipe-line station at Healdton, Oklahoma. Now on 24-hour duty.

. . . the life lines of our war economy . . . with

LE ROI ENGINES

operating on Gasoline — Natural Gas — Butane

Steady, uninterrupted service in transporting petroleum and its products through pipe lines has become a matter of grave concern to the nation. Here Le Roi engines are doing their part for both major and independent companies — standing up, with minimum maintenance, under the grind of 24-hour operation. • Behind this performance is a quarter-century of experience in designing and building heavy-duty engines for industry's tough jobs. Le Roi features assure you of low first cost — low installation cost — low operating and maintenance cost — and the extra reserves of power, the extra factors of safety that pull you through emergencies. • Power your next pipe line job with Le Roi engines, and be confident of results that back up your good judgment. Write, stating size of engine in which you are interested, and we will send bulletins giving complete details. •

- 4 to 100 H. P. engines for gathering and pick-up pumps.
- 100 to 400 H. P. sizes for main line, standby, or emergency service — capable of handling 12,000 to 35,000 barrels per day.
- Engine and pump may be assembled as a single unit.
- Compact stationary unit with portable features — readily transferred.

P-12

OUR PRODUCTS Described in the COMPOSITE CATALOG

LE ROI COMPANY, MILWAUKEE, WIS. • TULSA, OKLA.

Southern Engine & Pump Company, Houston — Dallas — Kilgore, Texas
General Machine & Supply Company, Wichita Falls — Odessa, Texas
Western Machinery Company, St. Louis, Missouri • Centralia, Illinois

# ON THE GREATEST PIPELINE PROJECT EVER UNDERTAKEN!

## BARRETT PROTECTION ALL THE WAY FROM TEXAS TO ILLINOIS

Within six months of authorization, America's great new 550-mile war-emergency oil artery will be completed and operating.

It is an important fact that preliminary to the acceptance of the project by the government, OPC thoroughly investigated every proposal for making the pipe out of substitute materials, including concrete, glass, wood fibre, plastic, reinforced fabric, and rubber.

*The material chosen was 24" seamless steel pipe, A.P.I. standard specification, coated throughout its entire length with Barrett Coal-tar Enamel.*

Barrett Enamel was chosen because it has superior resistance to electrolysis, soil acids, alkalis, and mechanical stresses, and because it is economical.

In short, it assures many years of efficient, trouble-free operation.

Years are important to the great new Texas-Illinois line . . . for years after the war it will serve the oil industry as an economical carrier.

We consider the use of Barrett Enamel on this line one of the greatest of all tributes to Barrett materials and service.

**FIELD SERVICE**—Our Pipeline Service Department and staff of Field Service men are equipped to provide both technical and on-the-job assistance in the use of Barrett Enamel.

Barrett PIPELINE ENAMEL

**THE BARRETT DIVISION**
ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK

total for any certain period will be the most economical even though the pumps are not working at their highest efficiency. By reducing line pressures one-half, we still can move nearly three-quarters capacity; and one-third pressure will move half the capacity.

### Advantages of Centrifugal Pumps

A centrifugal-pump installation starts off with many obvious advantages over the reciprocating type in pipe-line or other high-pressure work. These advantages may be stated as: (1) low first cost; (2) reduced floor space, weight, and foundation work; (3) low maintenance cost; (4) flexibility; (5) automatic or semiautomatic operation. No engineer who has kept books on the first cost, installation cost, and maintenance expenses of centrifugal pumps as compared with former types needs any further convincing about the economy of centrifugals. A number of notable examples exist where a three-story building was required to house a reciprocating pump and when replaced by a centrifugal, only a small "dog house" or no house at all, sufficed.

Of all the advantages, flexibility can be and often is found to be the most important. Changes in capacity, head, and horsepower can be made by altering speed or impeller diameter as we have seen above.

A recent notable example of flexibility of centrifugal pumps is in the Plantation Pipe Line installation. This 1,200-mile, 12-in. gasoline line was designed to start with a capacity of 60,000 bbl. per day, later on to be increased to 90,000 bbl. per day which will double the friction pressure loss and the number of pump stations. The pumps were built to operate at the lower capacity with the present impellers, then when the increased capacity is needed, high-capacity impellers will be installed in the same pumps and the cost of the changeover will be negligible.

A very interesting feature of this job is shown in the performance curve (Fig. 2) which shows head capacities, efficiencies, and horsepower characteristics for the Plantation Pipe Line pumps for both the high and low capacities. It will be noted that the highest efficiency is reached at the 90,000-bbl. rate, but only a slight loss in efficiency is shown at the lower 60,000-bbl. rate. This, indeed, is flexibility at constant speed, at low cost and is not obtainable by any other type of pump made today.

Automatic or semiautomatic operation of high pressure pipe-line pump stations are becoming more and more general. When a centrifugal pump is direct connected to an electric motor, simple devices are obtainable through ordinary commercial sources for starting, stopping, and regulating pressures of the whole trunk line. Remote control of operations is also accomplished by simple means and in the not-to-distant future we may expect a trunk-line pump station buried in the ground and covered up. There are already centrifugal pumps which are operating, buried underground, with only grass marking the spot.

### Cavitation

The disadvantages or what might better be termed, the limitations of centrifugal pumping are (1) priming and (2) low suction heads.

Priming in ordinary oil-country installations is no problem, for the usual suction heads, as a rule, take care of the priming.

The term "flooded suction" may be used by manufacturers in their performance guarantees and this term has come to mean a positive head on the pump at all times. The modern high-efficiency pumps in service today with their high specific speeds, must have a suction head with a safety factor above the starting point of cavitation.

Cavitation, as the name implies, nas to do with a void or "cavity." If in any flow of liquids a void is formed, filled with air, gas, or fluid vapor, the phenomenon, cavitation occurs. Cavitation in a centrifugal pump is evidenced by noise and while all pump noises may not be caused by cavitation, a noisy centrifugal may be suspected of suffering from fluid starvation. The danger of cavitation lies not only in lowered output and reduced efficiency, but also in its peculiar ability to tear down and destroy the metal in the pump itself. In cavitation bubbles are formed in such a way that, in effect, they collapse and this implosion accompanied by washing of the fluid and certain chemical reactions accelerates the cavitation effect. It is most important that cavitation be prevented by supplying to the centrifugal at all times, a positive suction head, even if an auxiliary, low-pressure pump must be installed to furnish the required suction pressure.

Another consideration to be given to centrifugal pumping is that clean liquid only should be put through a high-pressure centrifugal pump. It is well known that gravel, sand, mud, and all manner of dirty, gritty, and abrasive liquids can be and are pumped with centrifugals—but not high-speed, high-pressure centrifugal pumps. A pipe-line centrifugal pump is built to extremely close tolerances. Packing glands, stuffing boxes, and impeller shafts will all feel the effect of dirty fluid and the cost of strainers and cleaners ahead of the centrifual will add much to the life and service of the installation.


### Acknowledgments

A. Hollander, consulting engineer, member A.S.M.E., Los Angeles, Calif.

Byron Jackson Co., Los Angeles, Calif.

Worthington Pump & Machinery Corp., Los Angeles, Calif.

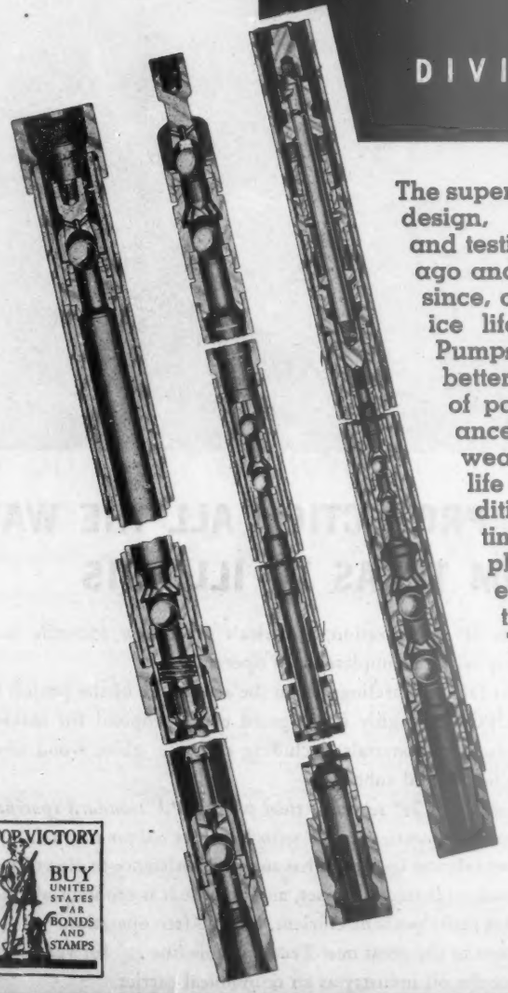


PACIFIC

Built-in Quality

PAYS

DIVIDENDS TODAY



The superior standards of Pacific Pump design, engineering, workmanship and testing, established twenty years ago and maintained constantly ever since, are paying dividends in service life to the owners of Pacific Pumps today. The development of better metals made possible fitting of parts to extremely close tolerances. Streamlined design cuts wear. Pacific Pumps mean longer life because they can be reconditioned as many as four or five times. Liners are ground up and plungers ground down. Pump expense per barrel of production is cut proportionately. This service is available wherever Pacific Pumps are sold.

WRITE FOR BULLETINS.

PACIFIC PUMP WORKS

Executive Offices and Plant:
HUNTINGTON PARK CALIFORNIA
*Export Offices:*
30 Rockefeller Center, New York
*Sales and Service:*
Offices in Principal Cities in the United States
*Subsidiary:*
MID-CONTINENT PUMP SUPPLY CO.
Tulsa, Oklahoma

PACIFIC *Engineered* PUMPS

# "CAN DO ALMOST EVERYTHING BUT CLIMB A RIG!"

## ...the New Buda Oil Field Jack!

HERE is an ideal heavy-duty lifting tool designed for Riggers, Truckers, Tool Pushers and Oil Field Roughnecks. This rugged, all purpose, all weather, 15 ton jack has many outstanding features:

- **LARGE EXTRA-HEAVY BASE**—With grooved bottom—provides firm footing for all lifting loads.
- **HEAVY FRAME**—Won't "bust" under overloads. Stands up under roughest handling and exposure. Prevents dirt and rocks from jamming operation of jack.
- **EASY LIFT**—Lifts on a series of short easy steps—no longer is it necessary to push on lever bar with back-breaking strains to lift heavy loads.
- **SIMPLE REVERSING MECHANISM**—Operated by merely pushing with foot or lever bar.
- **TOE LIFT**—Gets under low clearances, raises machinery, heavy loads safer.
- **HINGED BASE**—Permits tilting of jacks—especially desirable in setting and locating in position mud pumps, drilling rigs, etc.

**LINES 'EM UP FAST!** Hinged base on the 2215-S makes it easy to apply its powerful force to lining up heavy engines, pumps, etc. Plenty of power under control for fast, accurate lining up!

**HANDY . . . SAFE.** The 5-foot link chain furnished with the Model 2215-S has a link-grip hook on one end, a lift hook on the other. Note how the slotted head of the jack provides a powerful non-slip grip on the chain.

**BUDA Ball Bearing Journal Jacks**
Available in 7 improved models, from 15 to 50 tons capacity.

**BUDA Hydraulic Jacks**
Built in 15 sizes, both single and dual-speed models. Capacities, 1 to 25 tons.

**BUDA Standard Speed Jacks**
Available in 9 standard sizes, in capacities from 15 to 75 tons.

**BUDA Automatic Lowering Ratchet Jacks**
Available in 6 sizes, for capacities from 5 to 15 tons.

**THE BUDA COMPANY,** Harvey (Chicago Suburb) Illinois

*WRITE FOR COMPLETE DETAILS OR SEE YOUR NEAREST BUDA DEALER ABOUT THESE RUGGED, FIELD-TESTED OIL FIELD JACKS!*

*Insist on* **BUDA** *Oil Field Jacks and Engines*

## New Practices Improve Crude And Products Line Operation

*(Continued from Page 79)*

can be seen that both No. 1 and No. 2 stations are always in unison with each other because No. 1 station directs or controls every station directly ahead of it throughout the whole line. All stations except No. 1, unless there is storage at some point along the line, operate on suction-pressure control. It can be seen that when No. 2 station or any station along the line has an emergency shutdown then the suction connections, fittings, pumps, etc., are, until the station valves are closed, subjected to one-half or more of the main-line pressure.

On old revamped systems storage tanks are usually available but to eliminate evaporation losses, etc., these tanks are not used except when storage is desired. However, one of these tanks should be put in service for emergency use. The tank is connected to the station suction line to the pumps and can receive when the suction relief valves open when pressures exceed their setting point. Otherwise, products pumped do not go into storage at any point on the system. It can be readily seen that to eliminate moisture absorption on the system the products transported should be kept from unnecessary tank storage.

At locations where there are bulk-station take-offs, and several products are handled in the line tenders or displacements, each product after passing the pressure-reducing valve, which controls the flow rate, should have its own separate line from the main line to eliminate contamination and line-drainage operations.

Bulk-station take-offs do not interrupt the line operation as each station, directly affected by this take-off, continues to function in unison with the station it receives from, and all are controlled by the No. 1 station.

### Pipe-Line Scrapers and Line Observations

The pipe-line scraper is a wonderful small piece of mechanism but from the writer's observations it has never been given a decent chance to finish its job properly. It has been redesigned times untold but still the old original design will do a good job if properly and intelligently used. Every pipe line uses them; but how? Even in crude-oil service it is rarely that scrapers continue to be used until the desired results are obtained. After a scraper has gone through a line (in general reference is to old lines), and flow rates are improved some, it is hardly ever followed up by other scrapers to attain the original objective. If these scrapers are properly used (and this is a simple matter) we would not be hearing it said that this line or that has a "C factor of 100-200." If a line will not give C factors higher than these stated then something is wrong with that line. From his observations the writer knows that high C factors can be obtained and maintained on so-called closed systems pumping butane and gasoline by the proper use of scrapers. Most of the so-called powdered oxides and precipitations found in old and new lines are the original mill scale. But of course a similar substance due to a condensate reaction is found in lines away from the original station or between stations where storage tanks are used.

Scrapers properly used will maintain high flow rates. Why should we have large investments tied up in lines that scrapers will not go through?

Proper fitting and mechanically correct scrapers should always be used. And if these scrapers arrive at their destinations with damaged parts then it is certain that they have not completed their job. Others should follow until all arrive in good working condition. Various types and designs of scrapers are in use and as a rule each design has its particular duty to perform. Care should be taken with the rubber-disk type scrapers to insure that they do not gang up on slowed-down scrapers ahead if this method of cleaning is used. When scrapers are "lost" with particular reference to the old original type, it certainly is not advisable to try to push the lost scrapers through with the rubber-disk type, because the latter will nearly always plug the line. The disk type of scraper can be redesigned with small orifice openings in disks so that the pluid pressure behind the disk will wash out obstructions of scale piled up ahead.

On old crude lines which are to be used for products service, scrapers should be run for short distances where practicable in order to get rid of cleanings as quickly as possible. A true picture of any line's internal condition can be determined first by the mechanical defects or wear on the scraper upon its arrival and secondly by results as shown by material removed from the line. From observations noted, mill scale is present in lines for years and this is especially true of crude lines. While mill scale apparently does not particularly slow up the movements of crudes, it certainly does slow up fluid flow when combined with other reactions in butane and gasoline lines.

Devices to remove dirt, the various oxides, and condensate should be installed on all lines at proper points along a butane or gasoline-transportation system.

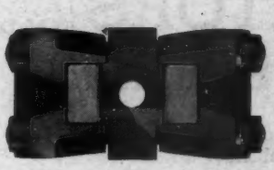
In conclusion the writer wants to make this point clear, that he does not say that inhibitors, etc., as used at the present time are not "paying dividends" in keeping up high-capacity performances, but he does believe these same lines with the proper handling and use of scrapers would eliminate most of this added cost.

MARSH
YOUR NEEDS built the Mastergauge
IT'S no simple matter to produce a pressure gauge that possesses the highest degree of accuracy and at the same time has the stamina to cope with the toughest service conditions.
Such a gauge was needed in the oil industry; so all the knowledge we have acquired in 75 years of instrument building was brought to bear on meeting this need. The result was a gauge that filled this big order as it was never filled before—the Marsh "Mastergauge".
Its service record proves that it will maintain its accuracy under conditions that ordinary gauges could not withstand. Moreover, if it is knocked out of adjustment by abnormal shock, its accuracy can be quickly restored with the twist of a screwdriver —thanks to the Marsh "Recalibrator".
The efficiency of the petroleum industry is a primary factor in winning this war. Instruments like the "Mastergauge" are a vital part of that efficiency.
JAS. P. MARSH CORP., 2065 Southport Ave., Chicago, Ill.
GAUGES

# FOR EVERY GAGE REQUIREMENT

Whatever your liquid level gage requirements, there is a Penberthy Gage that will meet your needs. These gages are suitable for the various pressure and temperature conditions of the oil industry. All Penberthy Gages conform with A.P.I.-A.S.M.E. requirements.

*Write for a copy of Catalog 34-A.*

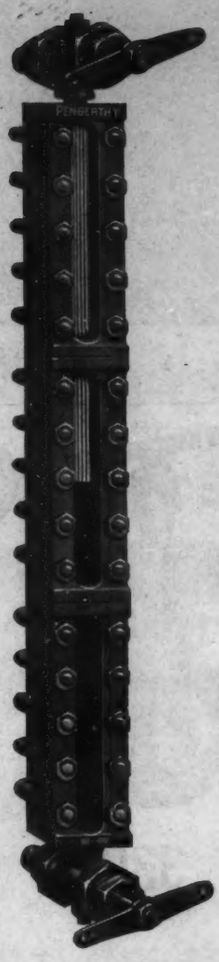


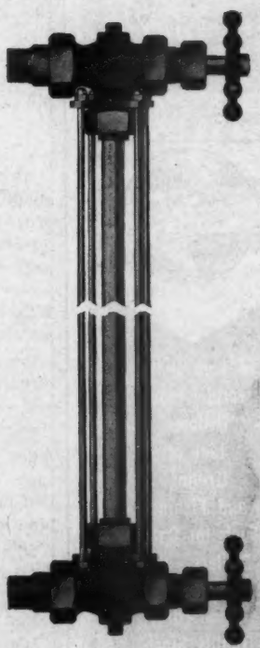
**PENBERTHY**
***Transparent***
**DROP FORGED STEEL LIQUID LEVEL GAGES**

Used to observe color and density of liquids under high pressures, and/or temperatures. Construction is exceptionally rugged . . . similar to Reflex types.

**PENBERTHY *Reflex***
**DROP FORGED STEEL LIQUID LEVEL GAGES**

Liquid shows black — empty space shows white. Preferred wherever liquid level must be easily and positively visible . . . and when liquids are under high pressure or at high temperature.



**PENBERTHY *Reflex***
**WATER GAGE SET**

Water shows black — steam shows white. U-Bolt construction is strongest and simplest to service. Glass replaced by simply removing nuts on face of gage . . . unnecessary to work between gage and boiler.

**PENBERTHY**
**DROP FORGED STEEL LIQUID LEVEL GAGES**

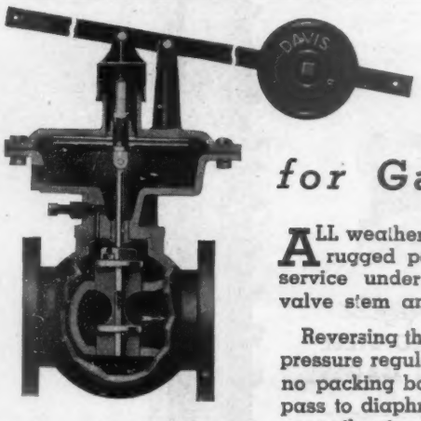
Made of Chromium-molybdenum alloy temperature-raising steel, extra heavy throughout. Stainless steel trimmed. Tubular glass type gages also available in various other metals suitable for practically all conditions.

PENBERTHY PRODUCTS

## PENBERTHY INJECTOR CO.

DETROIT, MICHIGAN • Canadian Plant; Windsor, Ontario

*Left: Section of Ventura-Wilmington pipe line in California, showing rough terrain over Santa Monica Mountains.*
*Right: Alignment fixture hold pipe ends of Portland-Montreal line, while first bead of welded joint is started*


# *Weather-Proof* REGULATORS

## *for* Gas-Gathering Systems

ALL weather is good weather for Davis Field Regulators. Their rugged patented construction insures reliable, trouble-free service under any outdoor conditions — And stainless steel valve stem and stem bushing resist corrosion from the inside.

Reversing the counterweight changes Davis No. 330 from back pressure regulator to vacuum regulator — No extra parts to add, no packing box to keep tight. Balanced valve and built-in by-pass to diaphragm chamber give smooth valve action and prevent vibration under severe operating conditions.

**No. 330 W**

For details on the complete line of Davis spring and weight-loaded regulators and other dependable valve specialties for oil field use, write for Bulletin G-2.

DAVIS REGULATOR COMPANY
2543 SOUTH WASHTENAW AVE., CHICAGO, ILL.

**DISTRIBUTOR:** Westcott & Greis, Inc., Tulsa, Dallas and Houston.

# Going! Going! Go——!
## Get Acme's Mud Collar NOW—To Help Overcome Material Shortages

Acme's Mud-Collar is made of "critical metals." When present limited stock is gone, we can't make delivery promises—as valuable as this rotary tool is in helping lick material shortages.

So don't delay! Order TODAY.

Here's what Acme's Mud Collar can do for you—as proven by satisfied users—in *any formation:*

It lessens drill pipe torque; assures faster, easier cutting, longer runs, fewer "green bits" and makes better hole. . . . Its 6 high-velocity fluid streams keep cutters clean, bit bearings "lubricated" and free of cuttings—while constantly flushing bottom. . . . In sticky formation, it also prevents mud rings and "balled up" bits.

Decrease material purchases by increasing the life of bits and drill pipe. Learn how—with this "wonder tool." Write NOW for full information.

(Also ask for Catalog No. 12. It gives valuable information on correct use and care of Acme cable tools.)

ACME DRILLING & FISHING TOOLS

Makers of the world famous "Drilmor" Line of Drilling and Fishing Tools for Cable Drillers - the Highest Standard of Quality Since 1900

**ACME FISHING TOOL CO.**
Parkersburg, W. Va. U.S.A.
Export Office — 19 Rector Street, New York, N. Y.

Defense Comes F.RST—with most of Acme's acilities now devoted to war material production. But we'll serve YOU, in a most friendly manner, as best we can.


# Arc Welding Simplifies And Speeds Construction Of Pipe Lines


By C. M. TAYLOR

Vice President, Lincoln Electric Co., Cleveland, Ohio


WELDED construction on the 24-in. pipe line to span 550 miles between Longview, Tex., and Norris City, Ill., will have as its background a wide and varied experience with 1,000,000 pipeline joints that have been successfully arc-welded during the last 10 years.

The pipe lines being laid this year in the United States to speed the nation's war effort will profit greatly by the enormous amount of welding research that has been conducted, and by wide and varied experience in the field.

The experience and research have made possible a simple and rapid construction that will enable the contractors to complete the laying of the Longview-Norris City line by Christmas. Construction started August 3. The line, which is considered the most important ever constructed in the United States, will deliver nearly 350,000 bbl. a day, an equivalent of 1,200 tank-car loads.

### Less Manpower Than Tankers

Although the steel required in the line will be about four times that necessary for construction of tankers with the same capacity, plying between New York and Texas, the simplified construction and operation of piping will require less manpower than that required for building tankers. This does not account for ship loss from submarine attacks.

Construction of pipe lines will also take tanker construction off docks badly needed for naval and cargo vessels.

Experience with arc welding thousands of miles of pipe lines on the American Continent each year has produced an increasingly simplified procedure. Today most connections between pipe sections are plain end joints, butt welded without backing-up rings. This applies to pipe even as large as 26 in. in diameter.

### Advantage of Welded Construction

Welded construction and the use of higher-tensile-strength steel has made possible the use of pipe of larger diameter, until today the more usual sizes are 22 to 24-in. with a wall thickness of ¼-in.

Position welding is gaining ascendancy over the firing-line method. Each joint is welded individually while the pipe lies over the ditch on timber skids. As the pipe line is laid down, the joint is held in place by a lineup clamp and

*Operators making a finished weld in section of 24-in. pipe on the 550-mile Texas-Illinois line of War Emergency Pipelines, Inc.*

tackers apply welds at intervals about the circumference of the joint.

The final welds are made without the necessity of rolling the pipe over. This type of welding is especially advantageous over rough terrain.

Another aid to the more rapid construction of lines is the growing practice of bending the pipe in the factory before it is sent into the field. More and more construction crews are using diesel engines for supplying electric power to the welders in the field.

### Lay 12,500 Ft. Daily

Simplified welding technique enabled Macco Robertson Construction Co. to lay 12,500 ft. of pipe daily on the Shell Oil Co., Inc., line between Ventura and Wilmington, Calif., recently. Every joint over the 83-mile line was position welded. The welds were made in three beads.

Through the Santa Monica Mountains, the welders encountered many difficulties in going over the rough terrain. Slopes of 60° were not unusual. The Lincoln "Shield Arc 85" electrode was used. These are manufactured particularly for welding high-tensile-strength steel in all positions.

This line has a capacity of 22,000 bbl. of oil daily.

The most simplified method of plain joint welding on the 236-mile pipe line from Portland, Me., to Montreal, permitted a construction speed that offset all delays in transportation of materials. Built for Standard Oil Co. of New Jersey under the pressure of the national emergency, this line eliminates a 12-day tanker haul along the submarine-infested Atlantic seaboard.

The pipe is high carbon steel, 12 in. in diameter with a wall ⅜ in. thick. It was laid in 40-ft. lengths. The plain pipe was simply butted together, tack welded with an electric arc to hold them in position and then welded with five beads. "Fleetweld 5" shielded arc electrodes, 5/32-in. were used for the first two beads. For the remainder the electrodes had a diameter of $\frac{1}{8}$ in.

In the plain-end joint weld, the spacing usually ranges from 0.040 to 0.065 in. Each pipe has a 30° bevel with a $\frac{1}{16}$-in. shoulder.

### Sizes of Electrodes

For welding without a backup, during which the pipe is rolled, a 5/32-in. electrode is usually recommended for the stringer beads on the smaller pipe sizes. For pipe sizes ranging from 8 in. to 26 in. the electrode may have a diameter of either 5/32-in. or $\frac{1}{8}$-in. For the second bead the $\frac{1}{8}$-in. electrode is used on the smaller sizes while the electrodes range from $\frac{1}{8}$ to ¼-in. on the larger. For the third bead the ¼-in. electrode is used on the smaller sizes and either the ¼ or $\frac{5}{16}$-in. on the larger.

The average speeds for shielded electrodes on this type of welding, range from six welds an hour on the 6-in. pipe, to 1.8 per hour on the 26-in.

Roll welding with the aid of a backup ring is somewhat faster than roll welding without a ring. For 6-in. pipe an average of seven welds can be completed in an hour and two and one-half welds for a 26-in. pipe. In this form of welding the electrode sizes for the stringer bead run from $\frac{1}{8}$ to $\frac{5}{16}$ in., while those for the second bead range from ¼ to ⅜ in.

For the position welding without the backup ring, the electrode sizes range from 5/32 in. to $\frac{1}{8}$ in. for the first bead, 5/32 to $\frac{1}{8}$ in. for the second and $\frac{1}{8}$ in. for the third. After the first beads are run by the tack welders, the average welds per hour range from five for 6-in. pipe to two for 12-in.


# When you want valves for oil and gas services

## . . . first see what KENNEDY offers in this 240-page catalog

**Here you will find complete descriptions of valves specifically designed for refineries, oil and gas fields, pump houses, and high pressure oil and gas lines, and furnished for a range of pressures in these services.**

**The section in this informative catalog devoted to these valves fully describes their many advantageous features, including specially heavy bodies and bonnets, simple sturdy mechanism, and extra refinements of design and construction that provide long life with trouble-free operation and minimum maintenance expense.**

**In this catalog, too, you will find similar data on the many other Kennedy products, including bronze and iron-body gate, globe, angle and check valves, malleable iron and bronze screwed fittings, cast iron flanged fittings and flanges, and various valve specialties, all of which have proved their merit in oil and gas industry services all over the country.**

**Be sure to write today for your copy of this helpful catalog.**

THE KENNEDY VALVE MFG. CO. . . . . ELMIRA, N. Y.

# KENNEDY
## *Extra Value in VALVES*

# Corrosion Coupons and Pipe-Line Predictions

THE importance of studies carried on with corrosion coupons is becoming more apparent. In planning for the future under present emergency conditions there are frequent occasions when calculations regarding the future service to be expected from pipe are more significant than under normal conditions. In determining the effect of corrosion by observation of coupons, it is necessary to adopt a method suited to conditions. It is believed that by applying appropriate methods it may be possible to eliminate some of the wide variations in pipe-life estimates. In Report 844 for the Bureau of Tests and Inspection, Pacific Gas & Electric Co., W. R. Schneider has given the following information which describes the details of the method devised for dealing with pipe-line-corrosion study.

Corrosion coupons or corrosion-test plates are removable steel plates buried near a pipe line or other structure, on which it is desired to know the rate of corrosion which takes place over a period of 1 or more years, due to soil action, stray railway currents, long-line currents, etc.

The coupons, or plates, are installed in pairs at pipe depths in the following locations:

1. Wherever the general electrolysis survey indicates that the pipe is discharging an electric current into the soil.
2. Where pitting has been found on examination of the pipe surface.
3. Where pipe failures have occurred.
4. In cathodically protected areas to show the effectiveness of the protection.

The data obtained by the study of a series of coupons covering a period of years are used to estimate the probable life of the pipe and the economic feasibility of applying protection.

When corrosion plates are installed on pipes covered by a protective coating or wrapping, it is necessary to determine the electrical properties of the covering. This can be determined by measuring the current flow in the pipe on each side of the coupon location or the current that is flowing between pipe and soil through the wrapping This latter test will require the use of an earth current meter of the McCollum type.

Coupons connected to a pipe covered with a coating having high insulating properties (at the suspected location) could still show signs of corrosion but would not show the condition on the pipe surface.

The corrosion coupons are 3 by 6 by $\frac{1}{4}$-in. steel plates cut from $\frac{1}{4}$ by 3-in. hot rolled steel bars. These coupons are cleaned by sand blasting, then drilled, numbered, and weighed.

### Description of Coupons

Coupons obtained in this manner have been found to give better results than those obtained from plates cut from the steel pipe. The cost of the former is considerably lower. The increased facility of measuring pit depth on a flat plate increased the accuracy of these measurements.

Practically no difference has been found between the pitting and weight loss of the coupons made from the ¼ by 3-in. flat steel strap and those cut from the 20-in. steel main.

The soil freed of all rocks and pebbles, and taken from the bottom of the excavation is tightly packed around the plates.

The corrosion coupons, except in a few special cases, are allowed to remain in the soil for a period of 12 months, and then replaced with a new pair of plates. The 12-month periods are usually terminated in the fall of the year and the plates are changed before the winter rains set in.

The coupons are usually covered with considerable rust and scale after being in the soil for a 12-month period. These corrosion products must be removed and all pits cleaned before the pit depths can be determined.

The cleaning is carried out with a minimum of labor by making the rust-covered steel plates the cathodes between graphite anodes in a 2 per cent solution of sulfuric acid. A direct current of approximately 1 amp. or more per coupon is passed through the electrolyte, the coupons being allowed to remain in the bath all day or over night. Since the metal coupons are electrolytically protected in the acid electrolyte while the current is flowing, no corrosion of the steel coupons will take place after the adhering oxides are reduced. It is unnecessary to turn off current or remove plates from solution at any definite time.

The plates when removed from the cleaning tank are bright and clean with only an occasional very deep pit requiring additional hand work.

After the plates are removed from the acid solution, they are washed in fresh water, dried, and rubbed over with an oiled cloth to avoid tarnishing.


BOMBS OR SABOTEURS MAY NEVER REACH YOU... BUT ARE YOU Ready?

IN WAR OR PEACE...

duGas

FIRE EXTINGUISHING APPARATUS

Guards Vital Oil Supplies

At refineries, wells, and trunk-line pumping stations across the country,* duGas mounts guard over vital oil supplies.

In sudden, extra-hazardous fires, where lives, valuable equipment, and precious stocks are involved, *speed* is all important. DuGas cuts priceless time from the extinguishing period.

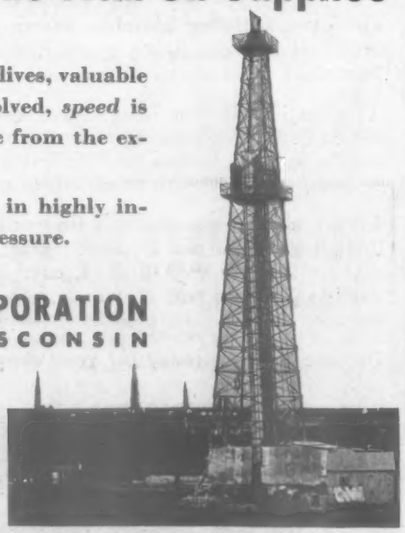
DuGas is particularly effective on fires in highly inflammable liquids, and on gases under pressure.

* Names on request.

DUGAS ENGINEERING CORPORATION
MARINETTE • WISCONSIN

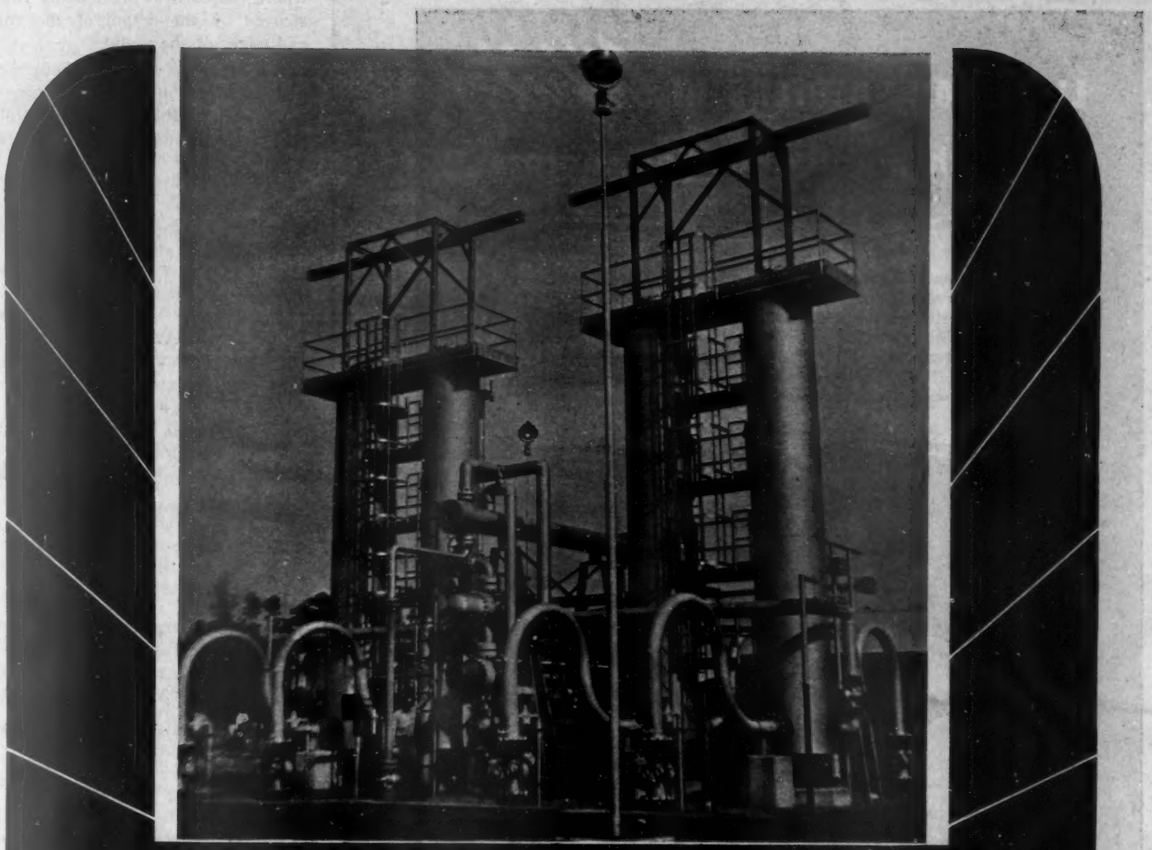
*Owned and operated by*
ANSUL CHEMICAL COMPANY

Represented in Principal Cities



CERTAIN, READY PROTECTION!
SURE, SWIFT, FIGHTING ACTION!

Approved by UNDERWRITERS' LABORATORIES, FACTORY MUTUAL LABORATORIES



PRITCHARD

# Hydryer dehydration UNITS

## GET THE JOB DONE!

The Pritchard Hydryer unit shown above will dry one hundred million cubic feet of natural gas per day to a dew point below minus 50 degrees F. It operates at 1200 pounds per square inch gage.

Standard units that will efficiently dry 10 to 1000 cubic feet per minute are available. Suitable for gases and liquids.

Designing · Engineering · Purchasing · Construction · Supervision

J·F·P&CO· Services

**J·F·PRITCHARD & CO·**

FIDELITY BLDG. KANSAS CITY, MO.

BRANCH OFFICES IN TULSA, OKLA. HOUSTON, TEXAS
ATLANTA, GA. CHICAGO, ILL. PITTSBURGH, PA. NEW YORK CITY

LIGHT FOR SOLDIERS IN White
. . . with Small Gasoline Motors
"Adequate" lighting at the front line, or wherever electric service is not available, can often mean the difference between life and death. How vital then, are the portable "lighting" units, powered by Briggs & Stratton 4-cycle, air-cooled gasoline motors, used by our armed forces. Their trouble-free performance affords dependable power wherever and whenever needed.
Our entire resources are now devoted to supplying Briggs & Stratton gasoline motors, to those whose equipment serves the war program, or is for "essential" civilian uses.
If you're now planning post-war production of gasoline powered appliances and equipment, or if your products fit these classifications, write us and we'll serve you as best we can.
Meanwhile Briggs & Stratton motors (2½ to 6 H.P.) now in civilian use, continue to set new records for trouble-free performance and long life. With reasonable care, their service can be still further prolonged.
BRIGGS & STRATTON CORP.
Milwaukee, Wisconsin, U. S. A.
BRIGGS & STRATTON


The pit depths on the coupons are measured by clamping the plate horizontally in a holder which is moved on a surface plate under a micrometer gage. Both sides of the coupon are explored with the gage and the deepest pit located. Measurements are made at the edges, where the corners are usually rounded off or destroyed by the action of the soil on the sides and edges of the metal.

The effective area of a coupon exposed to the action of the soil is only 33¼ sq. in. The deepest pit found on this area is multiplied by two, to approximate the deepest pit that is likely to occur on the surface of a pipe having over 100 sq. ft. exposed to the soil.

*The pit depth.*—Time equation used to correct the measured pit depth for time of exposure and to calculate the pipe life in the parabolic equation suggested by Putman.

$$P = Kt^n$$

In which:

$P$ = Depth of pit at end of $t$ year
$K$ = initial pit depth at end of 1 year
$t$ = number of years during which pipe or coupon was exposed to the corrosive action of the soil
$n$ = exponent which varies between 0 and 1 and is, to a great extent a function of the aeration of the soil; it approaches the lower limit in well-aerated soil and unity in poorly aerated soils such as moist clay, moist adobe, swamps, etc.

Since an average pipe line in open country is poorly aerated in winter during the rainy and flood seasons, and may be comparatively well aerated during the summer months, an average value of $n = 0.5$ is used.

This exponent will vary with the soil formation encountered in different localities, but agrees well with actual cases of the pipe life predictions and pipe failures.

The equation used for determining the pit depth at any time is therefore, $P = Kt^{0.5}$.

This equation is also used in reducing the corrosion coupon pit depths to a 1-year basis if the actual exposure has been greater or less than 12 months.

The pit produced on a corrosion coupon which is placed in the ground for a period of 12 months is a measure of the average corrosion taking place during the year on a newly installed line, and the pit depth on the coupon will be the depth of the pit produced on a pipe during the first year after its installation.

If the average annual corrosivity is constant over a period of years, the pit depth will increase at a decreasing rate.

The pipe life may be calculated from the pit-depth indications given by the corrosion coupon by the equation.

$$L = (T/2P)^2 \qquad (2)$$

In which:

$L$ = estimated pipe life in years
$T$ = pipe-wall thickness in inches
$P$ = maximum corrosion coupon pit depth
2 = constant used to correct for area

The corrosivity of the soil is seldom constant during a long span of years except in the case of marshes, tidelands, and similar locations.

The pitting of the control coupons shows that the corrosivity of the soil may vary over a wide range during a period of years.

### Determining Progress of Corrosion

In determining the actual progress of corrosion in pitting a pipe, and to determine the life of a pipe of known wall thickness, it is necessary to make due allowance for this annual variation of the soil corrosivity, the age of the pipe and that of the pits existing thereon.

The increase in the depth of a pit during any

year in terms of the pit depth produced by the soil during the first year, as shown by the pipe coupon (the soil corrosivity being constant from year to year) is given by the equation.

$$A = \sqrt{n} - \sqrt{n-1}$$

In which:

$A$ = activity factor = increase of pit depth each year in terms of the pit depth produced on a newly installed pipe during the FIRST year

$n$ = years of exposure of the pipe to the soil action to the date of the removal of the first corrosion coupon

The amount that is added to an existing pit during any year is found by multiplying the area-corrected maximum pit depth of the corrosion coupon by the "activity factor" corresponding to the age of the pit.

By applying the data obtained from the corrosion coupons each year in this manner, it is possible to properly account for the effect of the annual variations in the soil corrosivity and changes in the electrical conditions along a pipe line. This method also eliminates the wide variations in pipe-life estimates that are obtained when these estimates are based on the indications of single corrosion coupons only.

●

## Station Operation Departs From Many Customary Practices

*(Continued from Page 158)*

The control valve actuated from these instruments is normally automatically controlled, but is equipped for manual operation in the event of air failure or interruption of electric service at the stations. All the stations operating in a continuous section of line are affected by any change in flow rate that may occur. There are many changes in flow rates throughout the entire system. These are occasioned by the existence of the large number of delivery points or terminals, which may be utilized for multiple deliveries or for single full-line capacity deliveries. The station pressure controls are designed so as to immediately adjust each station to these varying flow conditions, thereby maintaining uninterrupted operation. The automatic shutdown features are coordinated with the regulating equipment in order to permit operation of the control system over its full range and only prevent operation of one or two units in the station in case the pressures exceed pre-established limits.

### Station Control

The control for each station centers in a control desk immediately in front of the gage board. Nearby are the attendant's working desk, teletype, and telephone.

The gage panel mounts a flowmeter for indicating and recording the rate of flow at or by the station, also the two pressure controllers and six gages indicating pressure at critical points.

On the control desk are mounted the red indicating lights identifying the functioning of each of the protective shutdown and alarm switches. Amber and green indicating lights show respectively the open and closed positions of the motor-operated suction and discharge valves, and the relative positions of the principal manually operated valves in the station piping.

To clarify the function of each device the desk top bears a schematic layout of the principal piping for the particular station. In this piping diagram are mounted in appropriate position the pushbuttons, indicating lights, and also ammeters showing current in each motor. A temperature indicator on which can be read, by means of thermocouples, the temperatures in motor windings, motor bearings, as well as in pump bearings, glands and casings, is similarly mounted. The accompanying illustration shows how conveniently the control desk and gage board serves as the focal point for indication of condition and control of all principal station functions. About 6 miles of control wiring, considered as single-conductor, is installed in a typical two-unit station, about twice this amount in one of the stations serving the main line and two branch lines. Approximately 60 miles of control wire is used in the initial station, including the tankage control and indication circuits.

●

## Conversion of Stanpac Gas Line Major Development

*(Continued from Page 130)*

on the alert to handle any emergency resulting from a bombing attack. No warning is issued on the yellow alert but on blue alerts all operators are notified and primary defensive steps taken. Normal operations continue during the blue alert but on the red or full blackout, line riders equipped with radio communication move to their respective posts and actually close the control gates on all main trunks. This preparatory work means that no crude oil or natural gasoline can be moved through a pipe-line system at any point during an attack. This precludes the feeding of any incendiary fires that might be started. Simultaneous with this precautionary work, all stations pumping into a refinery area are notified by a prearranged signal and instructed to suspend operations as the actual closing of valves on main lines completely stops the movement of any oil into an area under attack. With the lines closed, pump pressures at intermediate pump stations would show an abnormal increase but the operating plan is more definite than that warning and received faster.

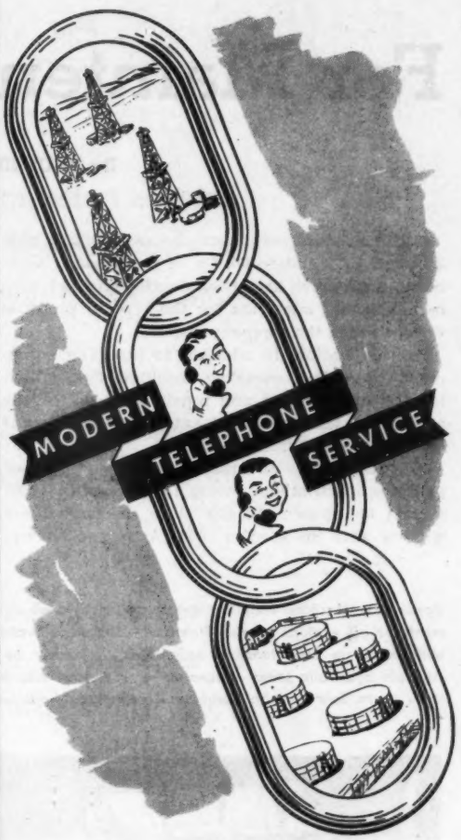
All pipe-line companies are members of this centralized control and while its actual operation cannot be explained in detail for obvious reasons it is foolproof and highly effective. In addition to effectively stopping all pipe-line movement, a general alarm also sets in operation the organization of repair crews and fire-fighting gangs to cope with any emergency. The thoroughness of the entire plan is amazing and plans have been worked out to cover all possibilities. Public utilities, which include companies supplying natural gas, are also acting under a centralized control and in the event of any emergency all gas flow is stopped by closing control gates or through the use of some other method. Gas lines within or near corporate limits of cities are equipped with valves that enable either the entire suspension of gas deliveries or the segregation of any unit within a major block.

One of the latest improvements is the development of a blackout lantern recently designated by T. H. Shepherd, light control consultant for the Los Angeles area, U.S.O.C.D., as being acceptable for use on excavations during full blackouts. Southern Counties Gas Co. pioneered work on this lantern and was assisted in its final development by Frank Hansen, light control consultant, U.S.O.C.D.; Dr. Boelter, of University of California, and others interested in the undertaking.

C. F. Briscoe, construction engineer of Southern Counties Gas Co., and who did considerable pioneer work on the lantern, is of the opinion that the use of a shield is much more desirable than the customary glass globe because any opaque material placed on the glass absorbs lantern heat from the flame and causes considerable rise in temperature of the globe. This makes the globe more susceptible to damage by differential expansion and in the event water comes in contact with the globe.


# Vital Link

*IN EFFICIENT PIPE LINE OPERATION*




**LOOK TO KELLOGG FOR PRACTICAL HELP IN MEETING WAR-TIME NEEDS FOR FAST RELIABLE COMMUNICATIONS**

**The war is bringing about great changes in the petroleum industry's transportation methods. Are your communications facilities in step with those changes? The need for dependable, speedy telephone service is greater than ever. And Kellogg is ready to help you supply it, whatever the need or problems involved. Equipment for reliable long-line transmission . . . for private branch exchanges to speed up transmission of calls and save valuable time for your busy people . . . systems that permit telephone conferences at widely scattered points . . . quality telephone parts and supplies . . . these and many other efficiency-boosting developments are worth your immediate investigation. Keep telephone service—the "vital link" in efficient pipe line operation—at highest possible standards. Kellogg field service engineers are prepared to give expert assistance on all communication problems.**

**KELLOGG**
SWITCHBOARD & SUPPLY CO.
6672 So. Cicero Ave. · Chicago, Ill.

# Standard of Louisiana Has Complete Shop For Maintenance

By PAUL REED

*Station building is ventilated by pusher-type fans near ceiling*

AT the Moore station on the main trunk pipe line of Standard Oil Co. of Louisiana, a number of procedures have been developed which promote efficient operation for the type of pipe-line system which the company operates.

At this station, in addition to pumping equipment, there is a complete machine shop which handles maintenance and repair work as well as a shop for taking care of automotive equipment used by the pipe-line department.

The station has an unusually large number of pumping installations, owing to the fact that the system has grown steadily since the first diesel engines were installed in 1909. As a result of upkeep and improvements, these engines are regarded as being in better shape than when they were installed.

On the station operating schedules, there are no regular shutdown and overhaul periods for the engines. The practice of the company is to run them as long as operation is satisfactory. However, when shutdowns do occur the load at Moore station can be carried by two spare units.

An unusual feature at Standard of Louisiana trunk stations is the installation of electric motor-driven pusher-type fans, close to the ceiling of station buildings, which insure adequate ventilation. Before the fans were installed, fumes in the buildings, particularly on hot, still summer nights, made working conditions so uncomfortable that engineers on duty were inclined to stay out of the engine room as much as possible. Fan equipment for stations is made in the company's machine shop which also has a large portable fan of its own that can be moved around where work is being done. At the Moore station, it is said that the fans near the roof keep the summer temperature inside the building within 2° of shade temperature.

Crude oil used for fuel at Moore is centrifuged with very satisfactory results since there has been a distinctly noticeable decrease in the wear

*Upper left: Machine shop at Moore station is well equipped for maintenance requirements of all stations on the Standard Oil Co. of Louisiana system. Upper right: Truck with boxes to hold tools in order that they may be readily accessible. Lower left: Portable hydraulic press equipment for removing and installing gears, crank disks, and other parts. Lower right: Boring mill especially built for work on large-cyclinder liners*

# AN AD WITHOUT PICTURES . . . . .

At the present time our entire construction effort is being devoted to bringing up interior oil lines in the United States to quicker, greater distribution at strategic points, and to the execution of important contracts in other countries.

The Williams Brothers organization is far-flung, operating today in widely separated sections of a war-torn world for the benefit of the United States and our allies.

Interesting as they would be, no pictures of these operations appear in this ad. And just where our own forces of engineers, skilled workmen and modern equipment are at work is a military secret.

Today, pipe lines are as vital to our national economy and allied victory as blood vessels in the human body, and we have accepted with deep appreciation and determination the great responsibilities assigned to us in the present world emergency.

## WILLIAMS BROTHERS CORP.

GENERAL CONTRACTORS ENGINEERS

Oil—Gas—Gasoline—Water Pipe Lines
and Pump Stations

NEW YORK • TULSA • ATLANTA • HOUSTON

of spray nozzles since this practice was adopted. Lubricating oil is given special treatment before heating to 150° F. and centrifuging. This treatment consists of mixing with soda ash and water to neutralize acidity and coagulate the particles of carbon in the oil. Following this treatment, the lubricating oil is blown to an overhead tank from which it flows to the centrifuge.

The company's wisdom in installing a well-equipped machine shop receives special confirmation in this period when it is often difficult to have work done in local shops which are loaded up with war work. The company's shop is primarily for repairs in pump-station maintenance.

The machine shop at Moore station has four lathes; a post drill, on which a reamer can be installed; a power saw; boring mill, and hydraulic press equipment. There is also a babbitt house and blacksmith shop.

Pump valves and engine valves, cast in local shops, can be machined down at this machine shop. After rebabbitting, bearings are machined on a lathe. Cylinders are bored by the boring mill. Pump cylinders are relined. Flywheels of large engines are rebuilt. The shop also has a machine for turning crank pins.

The hydraulic press has a capacity of 190 tons. It is hand-operated and can develop 6,000 lb. pressure. It is used for solid hub gears, crank disks and other parts which must be pressed on and off. Being fully portable, it is taken to the job. This saves considerable trucking expense. Four men with the portable hydraulic equipment can do a job in 2½ days which formerly called for 5 days for moving the work to the shop, with a crew of four men, plus the use of a truck for 3 days.

### Shop Equipment

The principal use of the crank-pin turning machine is to re-turn crank pins, journals and flywheel sections on engines driving pipe-line pumps. There is an advantage in doing the work on the job, rather than taking the machinery to a machine shop, for re-turning. A 300-hp. crankshaft of the type used on the line weighs 18,000 lb. and cannot be handled by any commercial shop in the territory in which the company operates. By means of this crank-pin turning machine, the master mechanic's organization can set up and return both of the crank pins in either 2 or 3 days with the labor of two men.

When the flywheels of crankshafts are badly worn, the same machine can turn them down to a smaller diameter. The company has facilities for bringing flywheels, which weigh 22,000 lb., to the Moore station shop. By electric welding with a special rod and reboring flywheel it can be made to fit the reduced crankshaft section.

The boring mill has been especially built to bore cylinder liners as large as 20 in. in diameter and take one cut, which is 72 in. long, without resetting the tool.

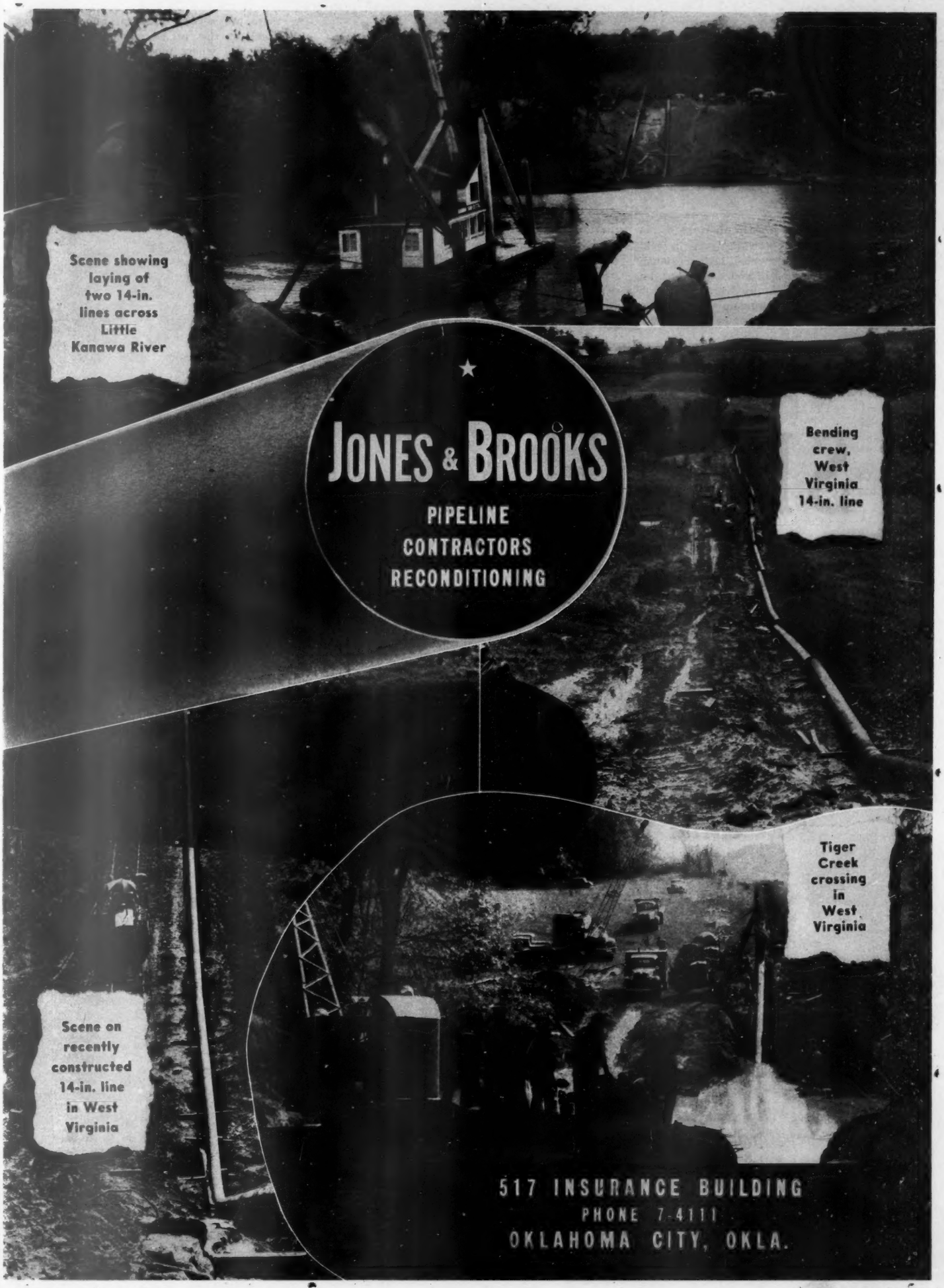
The automotive transportation section of the company's pipe-line department has adopted certain policies which are of interest. Five years ago a stop was put to operating trucks and automobiles after dark or before sunrise in order to reduce accidents. To check up on how this order is obeyed, record master recorders are installed on trucks—in some cases secretly—so as to obtain a complete history of the times the truck is in motion throughout a 24-hour day.

For the last few months, pressure tests have been made on tires every morning. If pressure on a tire goes down for 3 successive days, the tire is removed for tearing down and checking to get at the source of the trouble which should be corrected promptly, even though it may be small. The wear of casings is watched so that regrooving, as well as other measures, can be taken for lengthening their life.

With the war emergency additional loads have been thrown on the Louisiana company's system. In addition to maintaining shipments to the Baton Rouge, La., refinery, about 40,000 bbl. daily is being forwarded to Oklahoma Pipe Line for delivery through Ajax Pipe Line, Illinois Pipe Line and eastern systems for delivery at the East Coast.

# Methods for Modern Pipe-Line Construction

***In the projects built recently by W. A. Bechtel for major companies, methods employed are examples of modern pipe-line construction. Left: Making up 2,100-ft. strings of somastic-coated pipe for 4,200-ft. river crossing. Three dredges were used to open and maintain the trench on river bottom. Top, right: Preparing for roll welds, on a 22-in. gas line. Bottom, right: Lining up 1,900-ft. string of 12-in. pipe on cars preparatory to pulling across 3,800-ft. river crossing. Use of cars makes it possible to handle long sections without injury to the pipe and coating***


Scene showing laying of two 14-in. lines across Little Kanawa River
JONES & BROOKS
PIPELINE
CONTRACTORS
RECONDITIONING
Bending crew, West Virginia 14-in. line
Tiger Creek crossing in West Virginia
Scene on recently constructed 14-in. line in West Virginia
517 INSURANCE BUILDING
PHONE 7-4111
OKLAHOMA CITY, OKLA.

# Current Developments in Pipe-Line Welding

By A. N. KUGLER
Applied Engineering Department,
Air Reduction Sales Co.

THE exigencies of the present shortage of materials has accentuated certain trends in welded pipe-line construction which had previously been fostered for reasons of economy. Most important among these are the use of plain-end butt joints without liner or backing-up ring, and the use of higher carbon-steel pipe. In recent years the trend toward elimination of liner rings has been very pronounced, and the latest installations of pipe lines have employed plain butt joints with satisfactory results.

Whether the virtual abandonment of chill rings in so far as arc welding is concerned will become permanent remains to be seen, but for the present there are several practical reasons behind this trend. On the cost side, there is the cost of the liner, and where pipe ends are belled, the added expense which this operation involves. Both of these items total approximately $2 per 40-ft. length of pipe in the larger sizes around 12 in. More important, of course, is the elimination of this additional processing operation in the fabrication of the pipe, and eliminating the need for

*Welding a branch line to a stock-fitting T-member welded into the main line*

liners. The simplification of the joint thus eases the burden on the fabricators, and avoids delays in pipe-line construction caused by materials not being readily available. Of course in oxyacetylene welding this simple, open vee butt joint has always been standard—the chill ring offering no advantage and in fact many disadvantages.

In transferring and re-laying old pipe lines it is difficult to use any other method than the single-V butt joint. This is readily prepared by careful bevel cutting of the old pipe with a pipe-beveling machine, to accomplish in a single operation the severance of the pipe and the preparation of the end for rewelding at the new location.

High-tensile steel pipe has come into comparatively wide use in the last year, largely for reasons of expedience rather than because it offers any advantages in pipe-line construction. From the standpoint of the steel fabricator it is more practicable to produce steel of higher carbon content, in the 0.25-0.30 range, since such steel can more readily be turned out in the quantities required and in the time required. This grade of steel introduces no serious difficulties in the

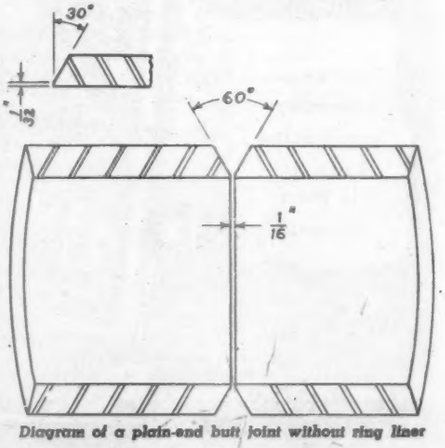



*Diagram of a plain-end butt joint without ring liner*

SHEEHAN

Today Sheehan Crews are Aiding Our War Efforts by Building Defense Pipe Lines and Doing Other Essential Work.

SHEEHAN PIPE LINE CONSTRUCTION COMPANY

*JOHN B. SHEEHAN, MANAGER*

NATIONAL BANK TULSA BLDG. TULSA, OKLA.

# A Message to OIL, GASOLINE & NATURAL GAS PIPE LINE COMPANIES

*from the . . .*

# B. & M. Construction Corporation

of Oklahoma City

WE DEEPLY REGRET that we have been unable to comply with your invitations to bid on your pipe line construction, repairing and reclaiming programs.

**BUT**

WE ARE HAPPY that we were in position to have answered the calls of the War Department for practically all of our organizations and equipment, and they are now engaged DOING THEIR BIT.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

**The following projects for the U. S. Army Engineer Corps have been completed or are now being built:***

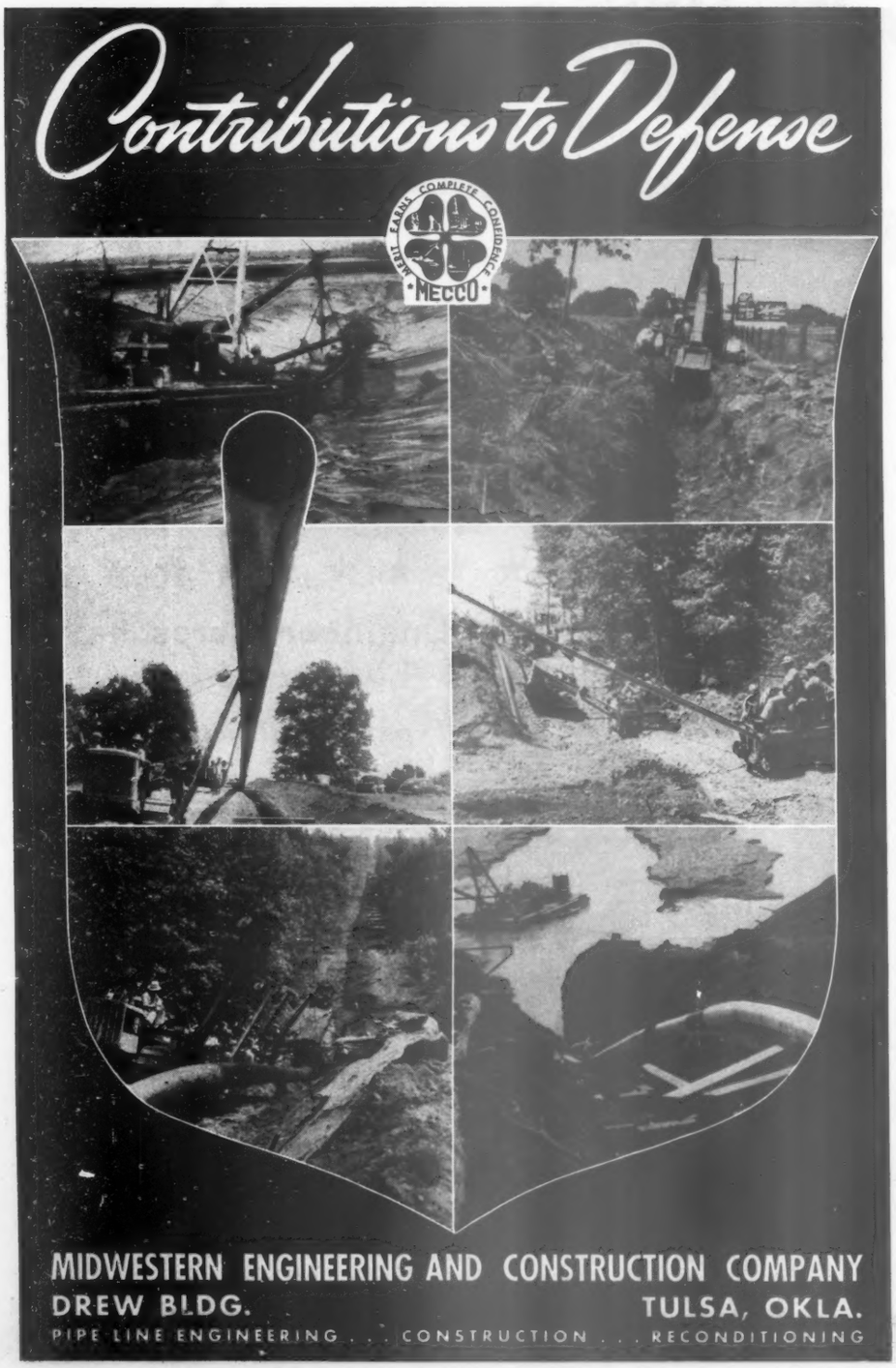
| *Camp or Cantonment* | *State* | *Type of Construction* |
|---|---|---|
| Ft. Logan | Colorado | Water Lines |
| Will Rogers Air Field | Oklahoma | Sewers, Storm Sewers |
| O. C. Aircraft Assembly Plant | Oklahoma | Sewers |
| Midwest Air Depot (Mobile Unit) | Oklahoma | Storm Sewers, Sewers, Water Lines, Gas Lines |
| Camp Gruber | Oklahoma | Water Supply, Gas Dist. System |
| Camp Bastrop | Texas | Additional Gas Lines to Camp |
| Marfa Basic Flying School | Texas | Water Lines, Sewers |
| Winfield Basic Flying School | Kansas | Water Lines, Gas Lines, Sewers |
| Independence Basic Flying School | Kansas | Water Lines, Gas Lines, Sewers |
| Garden City Basic Flying School | Kansas | Water Lines, Gas Lines, Sewers |
| Centerville Cantonment | Mississippi | Sewers, Storm Sewers |
| Camp Polk | Louisiana | Additional Gas Line |
| Camp Chaffee | Arkansas | Additional Water Lines |

**AND . . .** In addition to the above, we have two pipe line spreads busy for the United Gas Pipe Company, one pipe line spread busy for the Arkansas-Louisiana Gas Company and one spread busy for the Champlin Refining Company.

*Earl A. Benson*
*Wm. V. Montin*

* For Military reasons we are not able to state the amount of work involved, which is well up into eight figures.

*Left: Roll welding on a gasoline pipe line. Right: Maki g a tie-in position on oil line, using backhand method*



Contributions to Defense
MECCO
MIDWESTERN ENGINEERING AND CONSTRUCTION COMPANY
DREW BLDG.
TULSA, OKLA.
PIPE LINE ENGINEERING . . . CONSTRUCTION . . . RECONDITIONING


welding process, and the welding rod or electrode used may even be of the conventional low-carbon content in order to obtain ductility in the weld.

The accompanying diagram of a plain-end joint shows the dimensions required for most rapid production of high-quality welds. The spacing between pipe ends should be $\frac{1}{16}$ to $\frac{1}{8}$ in., with an included angle of 60°. The vertical shoulder should not measure more than $\frac{1}{16}$ in., preferably closer to 1/32 in.

Current practice in laying roll-welded pipe lines using plain butt joints is to line up and tack weld as many lengths of pipe as the nature of the topography permits. The tack welder working with the line-up gang makes his tacks about twice as long as the pipe thickness, and not more than two-thirds of this thickness in depth. Three tacks are sufficient on pipe up to 14 in. in diameter, and four for the larger sizes. The firing-line gang which follows deposits the first bead carefully, using a relatively small-diameter electrode for this first pass to assure full-penetration welds without inward protrusions. All welding is done downhand, with helpers turning the pipe with chain pipe wrenches.

After the first pass is laid, helpers clean the weld of all slag, and succeeding passes are laid using large-diameter electrodes and a heavier welding current. Two such beads laid over the first are usually sufficient to complete the weld.

Tie-in or bell-hole welding to join the continuous lengths is, of course, position welding, requiring greater skill on the part of the operator. The pipe is lined up on timber skids above or close to the trench, and the welder works his arc completely around this tie-in joint with the pipe in fixed position. Such welds are made with smaller sized electrodes, generally 5/32 or $\frac{3}{16}$-in., and a correspondingly lower welding current.

For stove-pipe welding over rough or swampy terrain the technique is similar except that all welds are position welds. This is not necessarily a delaying factor, for small-diameter pipe up to 6 or 8 in. may be welded almost as quickly by stovepiping as by sectional or roll-welding. However, despite the savings inherent in stovepipe welding resulting from the elimination of the line-up gang and reductions in handling and in equipment, the disadvantages of this method is that ditching cannot always progress with the same speed as the welding. These delays, when no pipe can be welded until the ditch is ready, are particularly troublesome today when the factor of time is so important in pipe-line construction.

The present critical situation in transportation facilities for petroleum products has not only made necessary the laying of additional pipe lines, but has also caused a trend toward large-diameter lines for oil and gasoline. These lines being of solid welded construction, will require the highest standard of welding, which fortunately the experience of the pipe-line contractors will enable them to provide.

*Our Contribution to the "All-Out" War Effort - - Conservation of Vitally Needed Steel Pipe*

PIPE LINE SERVICE CORPORATION through it's modern facilities for the application of protective coating and wrapping materials is contributing a part in the "all-out" war effort.

War demands safer transportation and in the not too distant future many unprotected pipe lines will cause serious losses and delays in production and man hours. . . . A lot of pipe will not be replaceable.

Our extensive facilities for pipe protection have enabled us to handle promptly all Defense orders and at the same time to service our regular customers.

Our facilities are larger and more complete than ever before.

We now have four strategically located units, the most recent addition being our plant located at Corpus Christi, Texas.

Our modern method of application and conscientious effort assures the highest quality of workmanship.

**PIPE LINE SERVICE CORPORATION**

MILL, TRAVELING TYPE OVER THE DITCH, YARD OR RAILHEAD COATING AND WRAPPING

*"Pioneers in Steel Pipe Protection"*

Franklin Park, Illinois . . . Glenwillard, Pennsylvania . . . Longview, Texas . . . Corpus Christi, Texas

# Oil Industry Committees for National Pipe-Line Projects

THE mammoth program of arrangements and of new construction of pipe lines to increase the flow of crude oil to the East Coast is the result of plans conceived and put into execution by men in the petroleum industry who have served on committees working with the Office of Petroleum Coordinator. These committees are as follows:

Temporary Joint Pipe Line Managing Subcommittee—W. Alton Jones, chairman; A. W. Peake, H. C. Wiess, R. W. Gallagher, H. F. Sinclair, H. T. Klein, W. F. Humphrey, R. H. Colley, J. F. Drake.

Temporary Joint Pipe Line Engineering Subcommittee.—W. R. Finney, chairman; G. J. Hanks, C. Bunje, Jr., C. H. Kountz, T. E. Swigart, B. E. Hull.

PROJECT 1.—To increase the movement of crude oil from Texas north and east through existing pipe-line systems by means of the installation of additional pumping units, loop lines, and the reversal of the Tuscarora pipe line.

Engineering Subcommittee.—C. Bunje (Illinois Pipe Line Co.), chairman; B. P. Sibole (Stanolind Pipe Line Co.), F. A. Stivers (Texas-Empire Pipe Line Co.), J. R. Peper (Buckeye Pipe Line Co.).

Managing Subcommittee—J. C. Donnell II (Ohio Oil Co.), chairman; A. W. Peake (Standard Oil Co. [Indiana]), P. R. Applegate (Buckeye Pipe Line Co.).

PROJECT 2.—The Plantation Pipe Line project: The construction of a 60,000-bbl.-per-day pipe line from the vicinity of Beaumont, Tex., to Baton Rouge, La., to supply the Plantation pipe line.

The expansion of the capacity of the Plantation pipe line by installing intermediate stations.

The extension of the Plantation pipe line from Greensboro, N. C., to a point in Virginia, northwest of Norfolk.

Engineering Subcommittee.—F. E. Warterfield, Jr. (Plantation Pipe Line Co.), chairman; S. S. Smith (Shell Oil Co., Inc.), J. A. Neath (Humble Oil & Refining Co.), F. E. Richardson (Pan American Pipe Line Co.).

Management Subcommittee.—F. W. Abrams (Standard Oil Co. [New Jersey]), chairman, Alex Fraser (Shell Oil Co., Inc.), Dr. R. E. Wilson (Pan American Pipe Line Co.).

PROJECT 3.—The construction of a 15,000-bbl.-per-day products line from Tiffin, Ohio, connecting the Shell and Sohio gasoline pipe lines with the Sun-Susquehanna system at Akron, Ohio, for the movement of petroleum products eastward.

Engineering Subcommittee.—S. S. Smith (Shell Oil Co., Inc.), chairman; S. H. Elliott (Sohio Pipe Line Co.), B. K. Morse (Sun-Susquehanna Pipe Line Co.).

Management Subcommittee.—Alex Fraser (Shell Oil Co., Inc.), chairman; S. A. Swensrud (Sohio Pipe Line Co.), J. Edgar Pew (Sun Pipe Line Co.).

PROJECT 4.—The reversal of the Keystone-Atlantic gasoline pipe line and an increase in the movement through the Socony-Vacuum pipe line from Buffalo, N. Y., so as to feed the Sun pipe line going south.

Utilize the Sinclair line in Pennsylvania when completed.

Engineering Subcommittee.—(*a*) W. F. Burt (Socony-Vacuum Oil Co., Inc.), chairman; W. Huff (Atlantic Refining Co.), B. K. Morse (Sun-Susquehanna Pipe Line Co.).

(*b*) L. M. Goldsmith (Atlantic Refining Co.), chairman.

Management Subcommittee.—R. H. Colley (Atlantic Refining Co.), chairman; A. F. Corwin (Socony-Vacuum Oil Co., Inc.), Henry Phillips (Consolidated Oil Corp.), J. Edgar Pew (Sun Pipe Line Co.).

PROJECT 5.—The reconditioning, rearrangement, and conversion of a crude-oil pipe line or pipe lines between Port Arthur, Tex., and El Dorado, Ark., into a products pipe line or pipe lines; reversal and extension.

Engineering Subcommittee.—C. M. Rosebrugh (Gulf Oil Corp.), chairman; J. E. Howell (Lion Oil Refining Co.), G. L. Gano (Arkansas Gas & Fuel Co.), S. W. Day (Standard Oil Co. of Louisiana), Sylvester Dayson (Premier Oil & Refining Co.).

Management Subcommittee.—E. Holman (Standard Oil Co. [New Jersey]), chairman; H. T. Klein (Texas Co.), J. A. Brown (Socony-Vacuum Oil Co., Inc.), Col. T. H. Barton (Lion Oil Refining Co.), D. W. Harris (Arkansas Gas & Fuel Co.), J. F. Drake (Gulf Oil Corp.).

PROJECT 9.—The construction of a 24-in. crude-oil pipe line from East Texas to Salem, Ill., with a capacity of 300,000 bbl. per day and the extension of this line eastward to the refineries of the New York and Philadelphia area to deliver 250,000 bbl. per day of crude oil.

Engineering Subcommittee.—W. R. Finney (Standard Oil Co. [New Jersey]), chairman; L. M. Goldsmith (Atlantic Refining Co.), B. K. Morse (Sun-Susquehanna Pipe Line Co.), Clay Briggs (Cities Service Oil Co.), J. R. Manion (Sinclair Refining Co.), C. M. Rosebrugh (Gulf Oil Corp.), J. G. Norton (Magnolia Pipe Line Co.).


# No Priorities On Performance....

**Times and conditions have changed since O. E. Dempsey entered the Pipe Line Construction Business in 1919—So have Methods, Materials and Machinery used in building these vital arteries of the great Petroleum Industry. We offer you 23 years of Experience in all phases of pipe line construction and the most modern equipment.**

**O. E. DEMPSEY CONSTRUCTION CO.**

**Oil and Gas Pipe Lines**

309 KENNEDY BLDG. TULSA, OKLAHOMA

Management Subcommittee. — W. Alton Jones (Cities Service Co.), chairman; R. W. Gallagher (Standard Oil Co. [New Jersey]), Harry Sinclair (Consolidated Oil Corp.), J. F. Drake (Gulf Oil Corp.).

•

## Alcohol Atomizer Developed As Freeze Preventive

To avoid trouble caused by freezing of hydrates in the gas-operated control instruments, an alcohol atomizer has been developed by the United Gas Pipe Line Co. organization. This has been described by Clyde B. Carter, foreman of the company, who says in United Log, that it is simple in operation. This method of introducing particles of alcohol into the control instruments is merely an arrangement of pipe collars, unions and a half-inch gage glass. These are all materials which can be found in discarded equipment or in any pipe yard.

Through a pipe perforated at the downstream end, the gas is introduced into a tank about half full of alcohol. It bubbles up through this tank, picking up particles of alcohol on the way and escapes through a pipe at the top, going back into the regular system.

The small amount of alcohol which the gas carries off is well paid for in that there will be no danger of freezing hydrates which would cause the automatic controls to fail in their work. By means of the gage glass the men can easily check the amount of alcohol in the tank, pouring in additional alcohol as required. During warm weather a bypass around this "atomizer" is employed.

The alcohol readily evaporates out of the natural gas in control lines as soon as gas pressure is released to atmosphere to operate controls. The same method can be used as an antifreeze in instruments operated by air or other fluids containing hydrates.

•

# BOOK REVIEWS

*TRANSACTIONS A.I.M.E. (1942), VOLUME 146, PETROLEUM DEVELOPMENT AND TECHNOLOGY. New York, N. Y. 565 pp. $5.*

This is the seventeenth book in the series which contains the papers and discussions presented before the Petroleum Division of the institute at meetings held in New York, Dallas, Tex., and Los Angeles, Calif., and also the petroleum statistical report covering 1941.

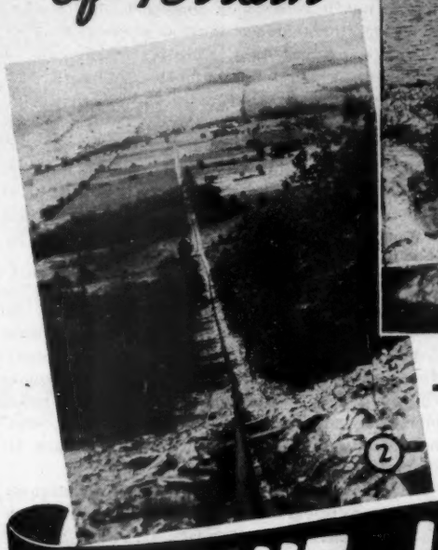
There are five chapters devoted respectively to production engineering, engineering research, petroleum economics, production and refining. The chapter on production engineering includes 7 papers, that on engineering research includes 11 papers, and that on petroleum economics includes 3 papers. The review of refining is by Walter Miller, and the introduction to the chapter on production is written by J. T. Duce. Domestic production report is broken down into 32 areas, and foreign reports include Argentina, Brazil, Canada, Mexico and Russia.

The volume may be purchased through the Book Department of The Oil and Gas Journal at the established retail price of $5.

*HANDBOOK BUTANE-PROPANE GASES. Arranged and edited by Arthur Rohman and Justus H. Krappe. Western Business Papers, Inc., Los Angeles, Calif. 480 pp. $5.*

This new edition has been completely rewritten, revised and expanded. New chapters have been added, illustrative material has been brought up to date, and tabulated matter has been revised in the light of recent experience and generally accepted practice. A chapter on "The ABC of LP-Gas" outlines briefly the basic principles of liquefied petroleum gas operation.


Through All Kinds of Terrain




—you can DEPEND on Whitaker to

DO THE JOB RIGHT!

WHITAKER MEN have that all-important "KNOW HOW." Latest methods and modern equipment enable them to push jobs through at record-breaking speed—across rivers, over rock-ribbed mountains, or through bottomless swamps and tangled jungles. These un-retouched pictures tell their own story:

(1) Crossing the Delaware River with a Socony-Vacuum Oil Co. line.

(2) Laying a line across the valleys and mountains of Pennsylvania for Sinclair Refining Co.

(3) Welding big-inch pipe after it has been reconditioned.

(4) Doping and Wrapping operations before pipe is laid and covered

O. C. WHITAKER COMPANY

*Pipe Line and Electric Welding Contractors for New Construction, Reconditioning and Taking Up Old Lines*

General Offices:
806 Dan Waggoner Bldg.
FORT WORTH, TEXAS

Office and Warehouse:
7812 Avenue I
HOUSTON, TEXAS

OVER 20 YEARS CONTINUOUS PIPE LINE EXPERIENCE

# Pipe-Line Movement of Oil Increased Rapidly in 1941

PETROLEUM pipe lines provided more transportation in 1941 than in any previous year, and the net addition of new pipe-line mileage by companies reporting to the Interstate Commerce Commission last year was greater than in any year since 1931, a report of the commission reveals.

According to a summary of the report, prepared by the American Petroleum Institute, nearly 105,500 miles of pipe lines, including crude-oil gathering lines, and crude-oil and refined-oil trunk lines, were operating at the end of last year, but this does not include an estimated 25,000 miles of pipe lines which are not required to report to the ICC because of private-carrier status or some other reason.

The 63,577 miles of ICC petroleum trunk lines transported 350,785,000,000 bbl.-miles of crude oil and refined-petroleum products, mostly gasoline, in 1941. This was an increase of nearly 15 per cent compared with 1940, yet trunk-line transportation revenues of these lines gained only 10 per cent, indicating a substantial average reduction in pipe-line tariffs. Gathering lines reported 41,858 miles to the ICC.

By conversion, the trunk-line movement is equivalent to approximately 52,000,000,000 ton-miles of transportation; the addition of the pipe lines not included in the ICC report undoubtedly would bring the total petroleum trunk pipe-line movement to more than 60,000,000,000 ton-miles. By comparison, the nation's Class I railroads delivered about 475,000,000,000 ton-miles of freight last year, largest in their history, and motor trucks carried nearly 45,000,000,000 ton-miles.

Because of duplications and omissions, no accurate data on the actual number of barrels of petroleum transported can be obtained from this report, but it is obvious that there has been a much greater increase in the movement of refined oils by pipe line than in the shipment of crude oil, although the latter is still more than 10 times as great. Refined-oil shipments originated by ICC lines totaled only 15,658,000 bbl. in 1931, but increased continually up to 71,915,000 bbl. in 1940, and jumped again to 82,373,000 bbl. in 1941. The ICC report covers only about two-thirds of all refined-oil pipe lines, hence total shipments of refined oils, almost all gasoline, by pipe line, is substantially greater.

Almost all of the crude oil produced in the United States normally starts its journey to the refinery in a gathering pipe line but only about 75 per cent of it continues all the way by trunk pipe line. The remainder is transhipped somewhere along the route, which may be 2,000 miles long, into tank ships, inland tank barges, and, increasingly in the last year, into tank cars, to complete the trip to the refinery.

Refined-petroleum products have been shipped from the refinery to market by pipe line only within the last 10 to 15 years, however, and although this method of transportation is growing with extreme rapidity, probably less than 10 per cent of the total output of United States refineries is moved in pipe lines. Tank ships, barges, tank cars, and tank trucks still transport the greatest quantities of gasoline, kerosene, and fuel oils to distributing bulk stations and terminals.

Average wages of pipe-line employes increased substantially in 1941 compared with 1940, the ICC report discloses. The lines reporting had 19,929 employes other than general officers and general-office workers last year, with a total payroll of more than $41,000,000. In 1940 these employes totaled 19,324, with a payroll of $36,800,000.

The complete ICC report gives detailed information on mileage, investment, balance-sheet items, operating revenues and expenses, taxes, net income, depreciation, employes, and oil transportation for each of 71 companies, as well as consolidated figures by years from 1930 through 1941.

●

## Falls Accounted for Large Accident Rate in 1941

Falls of one kind or another accounted for 23 per cent of all compensation paid for accident cases in industry in 1941, according to the National Safety Council.

"Handling objects" resulted in a larger number of accident cases than falls—24 per cent of the total, against 18 per cent for falls—but "handling objects" accidents were less severe and drew only 15 per cent of all compensation paid.

Falls and operations involving the handling of objects of one kind or another, combined, caused 42 per cent of all compensated occupational accidents and drew 38 per cent of all compensation paid. Machinery, vehicles, falling objects, hand tools and actions of "stepping on or striking against" each contributed smaller numbers of accidents and drew smaller fractions of the total compensation bill.

**Equipment Loaded for 40-Miles of 10-Inch Line**

Fully equipped to do first class pipe line construction anywhere.

We are proud of the satisfaction shown by the companies we have served.

Estimates furnished free of charge.

**ROGERS & VAUGHN CONSTRUCTION COMPANY, INC.**

Business Office: 716 Hamilton Building

WICHITA FALLS, TEXAS PHONE 2-2270

*Left: Lining up of connections started at this point at 7:10 a.m. By 8 a.m. the installation was in place and tack welded. Right: The effect of severe rains on the quicksand-type soil in this area produced difficult conditions. As soon as bell holes were cleared welders proceeded immediately with running stringer beads*

# United Gas Installs Total of 22 Hookups in 19 Hours

**By H. F. CARR**
District Manager, United Gas Pipe Line Co.

IN 1941 United Gas Pipe Line Co. completed construction of a 216-mile pipe line running from the gas fields of lower Louisiana to Mobile, Ala., where it connects with the Pensacola lateral line, serving the northwestern Florida area.

The portion of this line lying between Gulfport, Miss., and to a point approximately 40 miles eastward, is difficult to reach, as it traverses more than seven rivers and bayous, and many stretches of swamp and lowland. There are but a couple of roads crossing the line and the only means of reaching several points is by boat, or on foot, especially during or after any rainstorms.

A survey of the line, made for the purpose of determining as far as possible the extent to which dependable service could be maintained at all times and without any serious interruption in the event of line breaks, showed 11 points at which loop lines would be necessary. These places were all located where it would be almost impossible to carry materials and crews in the event of a break or service interruption during periods of bad weather.

The laying of loop lines was started in July and at the same time a fabrication yard at Gulfport put together valve installations to be set in at the ends of each loop. As soon as these valve hookups were completed it was decided to pick a favorable day, shut down the line from Gulfport to a point near Mobile and make the installations. There were 22 installations to make and after considerable discussions it was decided to attempt one of the biggest jobs that United had ever done—set in the 22 hookups within a single 24-hour shutdown period.

## Planning Most Important Part of Job

To anyone connected with the natural-gas industry, the seriousness of a shutdown on a major line for any length of time is readily apparent, especially if the line is primarily feeding to vital war industries whose constant operation is necessary. Wartime restrictions prevent any mention of the number and types of industries connected to the line, but they are many.

Before considering the job of installing the hookups in 1 day or over several days and with several shutdowns, a study of the loads, normal and peak, that could be expected on the line at various times, was made. As a result of the thorough study, August 19, almost a normal day, was chosen and the company planned for a 20-hour shutdown within a maximum limit of 24 hours. All the hookups were to be installed at one time. Any other method would have resulted in many shutdowns, during a season when rains came regularly and hard. Once all the valves were in, the contractors could go ahead with the construction of the loops, tying them in with the installations as soon as they were completed, thus putting each loop in service as soon as possible.

Planning of the shutdown was placed primarily in the hands of Earl V. Hamilton, Jr., construction engineer of United; Tracy Wilmuth, chief inspector, and Duke Davis, Jackson district manager. It may seem like a small detail, but a straight line map of the loops proved to be one of the most helpful bits of work in the course of the planning. This map listed all the materials and manpower needed at each location and the work which each of the crews would do. It was simple to follow and yet it made possible the visualization of just what materials should be on hand at every bell hole.

*Part of the yard at Gulfport, Miss., where fabrication of valves and fittings was done preparatory to installation*

The large amount of equipment required was taken from various districts on the United Gas Pipe Line Co. system, from the contractor, Whittaker, and rented through the courtesy of Industrial Engineering Corp. which had equipment in Gulfport during the coating of the pipe with somastic.

## Company's Welders in Charge

At each location a United Gas welder had charge of the job and these men came from all over United's system, from Wichita Falls, Jackson, Houston, Dallas, Baton Rouge, Monroe, Southwest Louisiana, and Shreveport, bringing with them their welding kits.

In the 3 days before the actual shutdown, men labored to dig the bell holes, put materials on location and have everything in readiness. The day before the job, trial runs were made out to the locations, making certain that all crews would be on location at the proper time in the morning. This was important because there was no means of communication along the line and over the whole 40 miles covered by the loops, except one telephone—a private line in a backwoods store.

Detailed written instructions were passed out the afternoon before the big job to all the men who would assist in blowing down the line. These instructions included, briefly, the times at which various valves were to be closed and when blowoffs were to be opened. The line had to be completely blown down by 6 a.m. so that the

welders could start making the cuts at 7. The instruction also included the method to be followed in turning on and purging the line after the completion of the work. At 12:30 a.m. August 19, the men detailed to this work left Gulfport to get to their respective locations.

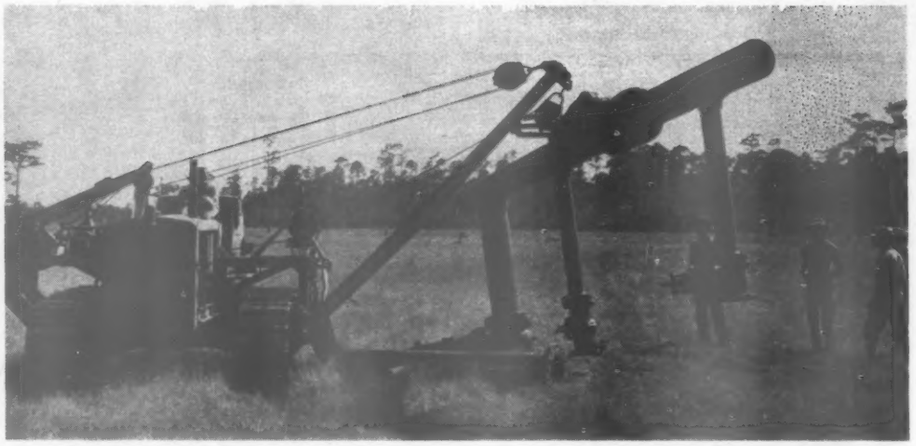
Valves were closed at 5 a.m. at 12 locations and a half hour later the line had been blown down. At 4 a.m. the unknown factor had presented itself in the form of a rainstorm which lasted long enough to get everybody soaking wet, fill the bell holes at many locations and turn the "roads" into muddy morasses.

Heavy rainstorms continued throughout the day, striking first one location and then another, hindering the job to a great extent.

Too great credit cannot be given to the men who worked on the job. The company welders "fell into their bell holes" as soon as the laborers, bailing out the bell holes with buckets, uncovered the pipe. Cutting out of the 20-ft. sections was accomplished with a minmum of fire, except at one location, near a sag, where fire held up the work for 40 minutes.

At Beaver Creek, one of the shorter loops, the rain turned the bell hole into quicksands and all night men worked at the caving hole, trying to keep it open for the work in the morning. This bell hole almost beat United in its attempt to do the job in 1 day. It kept on caving in spite of shoring, water pumps and constant bailing by the men. The largest crew, 10 laborers, was located at this hole.

The first tie-in was completed at 10:30 on the west side of loop No. 3. Average time was approximately 3 to 4 hours with some taking longer on account of weather conditions. The tie-in necessitated cutting out a 20-ft. section of line and installing the 20-ft. lengths of pipe to which the valves and blowoff had been welded in the fabrication yard before the start of the installations.



*Tractor carrying assembly which has been given a hydrostatic test before leaving place where it was fabricated before going to location for installation*

Gas was turned into the line for the purge at approximately 5 p.m. and the line was completely purged and blowoffs were closed and the main line back in service at 11:50 p.m. The big job had taken only 18 hours and 50 minutes.

During the shutdown it was necessary to curtail a few customers who had standby fuel. Most of the customers, however, enjoyed continuous service during the shutdown by means of the old Jackson-Mobile line which is served partially from Jackson and also from the fields in South Louisiana through a 10-in. lateral line which runs to Bogalusa on the Jackson-Mobile line from Mandeville Junction, upstream from the shutdown. The compressor station and the lateral line managed to hold pressures high enough to serve all customers at Mobile and Pensacola.

After the thorough planning and preliminary work, there were only two factors which could have caused the job to fail—the weather and the men. The weather was bad, but the men licked it. Welders bent their rods to get them beneath the pipe and above the water. They lay full length in the water as they ran their beads on the bottom of the weld.

Workers bailed with buckets, knee deep in water, and contractor's men worked side by side with them as they fought to get the job done. The spirit of the men was the only thing that made the job possible. They were competing with each other to see who would finish first—then those that finished their installations moved on down to other locations and helped those who had difficulty.

It was without a doubt the biggest job of its kind ever attempted by United Gas Pipe Line Co.


S. FOREMAN

C. COMPANY

GENERAL CONTRACTORS

PIPE LINES
WATER WORKS
SEWERS

ALL OUT WAR CONSTRUCTION

20 W. 9th St.
KANSAS CITY, MO.

# Study of Corrosion Aids in Protection of Pipe Lines

A NUMBER of assumptions which were prevalent regarding pipe-line corrosion only a few years ago have been changed as a result of better understanding of conditions. Of considerable value for engineer executives as well as others responsible for pipe-line construction and maintenance is a review issued by the National Bureau of Standards, U. S. Department of Commerce, entitled "Corrosion in Soils." This contains maps, charts and tables and discusses the present status of theories regarding pipe-line corrosion. The report has been prepared for those who have not made a specialty of following developments of the subject since they are primarily occupied with other pipe-line activities. Frequent references are made to the literature. Selections from this report are given below. The significance of this for the industry is indicated by the fact that the cost of leaks has been estimated by some to be between $50 and $1,000, including cost of repairing and damage done.

This paper is a summary and restatement of observations related to underground corrosion that have been presented in publications of the National Bureau of Standards and in technical books and journals dealing with corrosion. Its purpose is to answer questions frequently sent into the bureau regarding corrosion.

Underground corrosion is the result of a wide variety of forces, and an accurate prediction of the performance of an individual piece of metal is not to be expected. However, the average performance of an adequate number of specimens of a metal under specified conditions can be predicted roughly.

Differences of potential which are the chief causes of underground corrosion may originate in differences in the metal or soil, or in conditions incidental to the manner in which a pipe line or other metal structure is installed. Some of the causes of corrosion can be readily recognized and avoided; others may not be easily recognized, or may be unavoidable though known.

### 1. Introduction

The purpose of this paper is to answer frequently recurring questions as to the corrosivity of soils, the identification of corrosive conditions, and the prevention or reduction of corrosion losses. The paper is intended for the information of the nontechnical inquirer who has a specific corrosion problem for which he desires a practical solution. In order to understand the suggestions that are offered the reader must have a certain amount of information about soils and corrosion phenomena. For this reason some of the characteristics of soils, metals and coatings are discussed. For those who care to go more deeply into the subject, references to some of the more important books and articles dealing with corrosion are given. To enable those generally familiar with soils and corrosion to find the discussion of the topic with which they are concerned without profitless reading, the discussion of the characteristics of soils and corrosion has been separated from the discussion of their effects. This has necessitated some repetition.

The paper is chiefly a resume of material already published and contains no new data. In certain cases suggestions have been made regarding the mitigation of corrosion which are based on the judgment of the author rather than on the direct results of specific tests or experiments. These passages have been identified.

### 2. Theory of Corrosion as Related to Buried Metals

Most corrosion can be accounted for by the electrochemical theory, which postulates a difference of potential between two points on a metallic conductor exposed to an electrolyte. Positively charged metal atoms, ions, are removed from that part of the surface undergoing corrosion, the anode, and reactions between these ions and others from the electrolyte result in a flow of current and the deposition of hydrogen or other material at the noncorroding surface (cathode). Material may also be deposited at or near the corroding surface. Often these reactions control the rate of corrosion by their effects on the potentials of the metal surfaces or on the resistance of the electrical circuit.

The difference of potential which may be regarded as the cause of corrosion is analogous to a difference in temperature or a difference in the pressures between two points in a fluid. It represents the tendency of the metal to go into solution, but it does not indicate the rate of corrosion. The rate of corrosion is more closely related to the amount of current leaving the anode, but the measurement of this current is usually difficult if not impossible except under special conditions in the laboratory.

The effect of the flow of current on the potentials of the electrodes in soils under certain controlled conditions has been discussed by Denison.[1]


J. C. TRUMAN CONSTRUCTION COMPANY

Pipe Line Contractor

*Identified with pipe line industry for over 25 years*

General Office

220 North Main El Dorado, Kansas



General Pipe Line Contractors

BLACK

CONSTRUCTION CO.

409 MAGNOLIA BLDG. RIVERSIDE 6400

DALLAS, TEXAS

E. A. BLACK L. H LOCK J. I. BISHOP

The changes studied by Denison occur quickly and largely disappear if for any reason the current is interrupted for a short time. More permanent changes in current results from deposition of solid deposits of primary or secondary corrosion products.

The decrease in the rate of corrosion of iron in soils over long periods of time has been discussed from a theoretical standpoint by Fetherstonhaugh,[4] by Brennan[5] and by Hoff,[6] and the relation between pit depths or loss of weight and time has been expressed by empirical equations by Scott[7] and Putnam.[8]

Originally, impurities, inclusions and strains in the metal were regarded as the chief causes of the differences of potential, and a very pure commercial iron was developed as a corrosion-resistant material. Mill scale was also thought to be an important cause of corrosion, and one rolling mill developed a "scale free" pipe on this account. Somewhat later the theory of protective films resulting from initial corrosion was promulgated and efforts were made to formulate alloy steels that would produce protective layers or films of oxides or other corrosion products. The success of some of these efforts will be discussed later. Exposure tests of ferrous pipe materials called attention to the wide range of the rates of corrosion of the same material in different soils and the similarity of the rates of corrosion of different ferrous materials in the same soil. As a result of these observations, attention was turned to soils as an important factor in the rates of corrosion of buried metals. Still later, Evans'[9] theory of differential aeration offered a satisfactory explanation for the cause of much underground corrosion.

According to this theory, the surface of steel abundantly supplied with oxygen is cathodic with respect to parts of the same surface less accessible to oxygen. Since the rate at which oxygen can reach buried metal varies greatly with the texture of the soil, its moisture content, and the depth of burial of the metal, differential aeration is especially important with respect to underground corrosion. Shepard[10] produced in the laboratory a difference of potential of 0.9 volt between wet and dry soil from the same source placed on a sheet of steel.

In 1934 an additional factor which under some conditions may influence the rate of corrosion was proposed by Von Wolzogen Kuhr and Van der Vlugt[11] who showed that corrosion has accelerated in the presence of sulfate-reducing bacteria. The bacteria discussed by Von Wolzogen Kuhr are active only under anaerobic conditions. Beckwith[12] has suggested that some aerobic bacteria also may influence corrosion. The chemical changes associated with corrosion in the absence and presence of bacteria are summarized by Hadley.[3]

The theory of corrosion is discussed at length by Evans,[9] Burns,[13] Speller[14] and Hoar[15] and to a less extent by the authors of many articles dealing with some phase of corrosion.

### 3. Soils

Pedology, the science of soils, was developed to promote agriculture. However, since soils constitute an environment of corroding metals and affect the rate of corrosion, a certain familiarity with pedology is helpful to those concerned with corrosion. In this section of the paper the discussion will be limited to the characteristics and properties of soils as such. The effects of soils on corrosion will be discussed in a subsequent section.

**1. Definition and classification.**

A soil may be defined as two or more layers of finely divided, modified rock material, having well-defined characteristics. In general, the term soil is applied to the first few feet of material covering the level and moderately inclined portions of the earth. Crushed rock or unmodified rock on mountain tops is not soil and, strictly speaking, earth removed from its original position is not soil if it has lost its structure. Classification of soils is based on their physical and chemical characteristics and not on their geologic origin or geographic location, although the soil characteristics may be influenced by both the origin and the location of the soil.

Soils may be divided broadly into two classes—those in which lime accumulates in the subsoil (Pedocals) and those in which it does not (Pedalfers). In the United States the first class lies generally west of a north and south line from northwestern Minnesota to a point on the Gulf of Mexico 100 miles north of the Mexican border. Marbut[16] has classified the well-developed soils of the Continental United States into eight great soil groups to which he has added several groups of undeveloped soils among which are muck, peat, rough stony land, sand and some others.

Each great group contains from 9 to 60 subgroups known as soil series, each of which is further subdivided with respect to type, i.e., as to the texture of the uppermost layer of soil. The three layers or horizons comprising the profile of most soil types may differ widely in texture, color, and composition. A soil name consists of two parts; the first designates the series and the second the type. The series name is usually taken from the locality where it was first identified; the type name describes the texture of the uppermost layer or "A" horizon.

The texture of a soil is determined by the percentages of the particles of various size groups. As to particle size there are two grand subdivisions—those materials having diameters of 2 or more millimeters (0.079 in.), which include gravel, cobbles and larger stones, and a group of mate-


THE J. G. WHITE
ENGINEERING CORPORATION

ENGINEERS AND CONSTRUCTORS
DESIGNERS AND BUILDERS OF

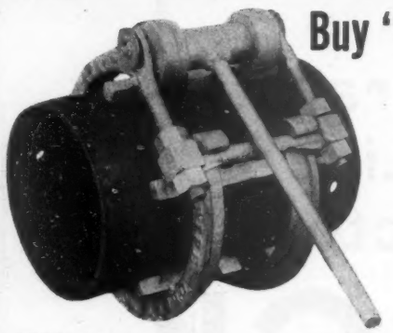
OIL REFINERIES
OIL AND NATURAL
GAS PIPELINES

CHEMICAL LAYOUTS
and
OTHER AUXILIARIES

NEW YORK
80 Broad Street

NEW ORLEANS
812 Gravier Street





Buy "TIPTON'S" and Get the Best

TIPTON
PATENTED
PIPE WELDING CLAMP
NEW AND EFFICIENT

HOLDS THE TWO ENDS OF PIPE
TOGETHER WHILE WELDING

WITH the Tipton Pipe Welding Clamp easy, quick and accurate welding of pipe lines is possible. Designed by engineers, it is now in general use by pipe line contractors and oil companies everywhere.

The operation is very simple; the clamp being placed in an open position over the joint between the welded line and abutting length of pipe. The lower half is raised and the clevis dropped in place—then an easy pull of the lever, which controls an eccentric pin, tightens the clamp firmly around both ends of the pipe. A steel spacer in the center of each cross bar inserts itself in the chamfered ends of the pipe, thereby aligning the pipe as well as holding it while being welded. Rigidity of clamp is effected by cast steel bars at sufficient intervals in the round about cast steel frame.

*Tipton Patented Pipe Clamps are adjustable, to fit slightly oversized or undersized pipe.*

*Distributed by*

THE CLARENCE L. BOYD CO., INC.

Guthrie
L. D. 1

TULSA, OKLAHOMA

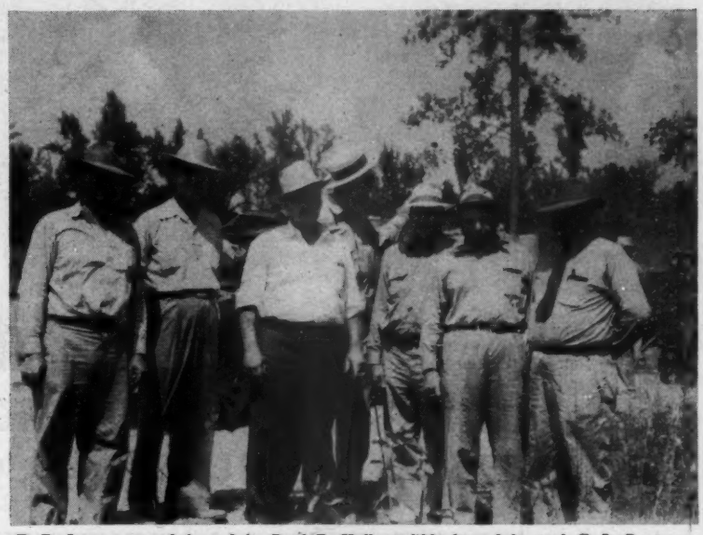
Tulsa
L. D. 745

BO BARDSLEY . . . Pipe Line Representative

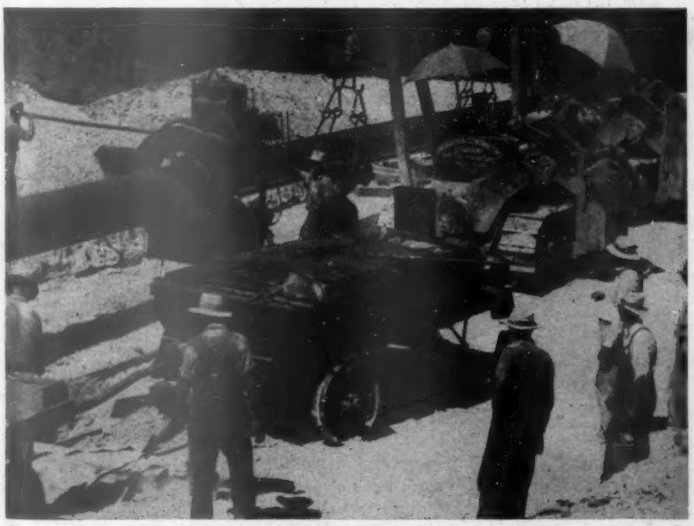
# FULL STEAM AHEAD
## WITH THE OKLAHOMA CONTRACTING COMPANY

**A year ago we were laying pipe for the sections of the gigantic Plantation Line and the line from Portland, Maine to Montreal, Canada. We have kept up our steam for Uncle Sam, and all effort now is concentrated on completion of the Texas-Illinois Line, which comprises a 163-mile stretch from Little Rock to the Missouri line. Our many years of experience in pipe line construction is reflected now in the progress of this line, which is well ahead of schedule with over 60 miles already laid.**

Section of the twenty-four-inch Texas-Illinois pipe line being laid by the Oklahoma Contracting Company across the scenic hills of Arkansas in Lonoke County.



T. R. Jones, second from left; Paul R. Halbert fifth from left; and C. L. Boatman sixth from left, executives of the Oklahoma Contracting Company, supervising operations of the Texas-Illinois line.



Seen here is Oklahoma Contracting Company's modern combination coating and wrapping machine, which travels 800 to 1,000 feet per hour.

The mammoth ditch digger of the Oklahoma Contracting Company sinking a ditch three feet wide and from four to six feet deep.

# OKLAHOMA CONTRACTING COMPANY
## PIPE LINE CONTRACTORS

**1515 MAGNOLIA BUILDING  CENTRAL 4531  DALLAS, TEXAS**

One of 15 suspension crossings carrying 8" to 24" lines on 200 mile line built by Holland Construction Co.

## Doing Hard Jobs the Safe, Easy Way

UNDERGROUND—OVERHEAD—STRAIGHTAWAY

One of many underground highway crossings on new line under construction

Scene near New Harmony, Ind., showing line being laid by Holland crews

Constructors of Oil, Gas and Gasoline Pipe Lines, River Crossings, Gathering Lines, Reconditioning and Waterworks.

**HOLLAND CONSTRUCTION COMPANY**

TULSA, H. T. (Bus) Holland, Jr. OKLAHOMA

## Parkhill Truck Company

*Established Since 1920*

ROY F. PARKHILL, *President*

*Parkhill trucks hauling and stringing 24" on War Emergency Pipe Line somewhere in Arkansas.*

**Pipe Line Stringing Contractor • Pump Station Machinery Hauling**

**Where Pipe Lines Are Under Construction You Will Find PARKHILL on the Job.**

We operate in 31 states by virtue of ICC Permits MC-30188 and MC-30188 Sub 3.

MODERN EQUIPMENT and EXPERIENCED WORKMEN • EFFICIENT, RESPONSIBLE

*General Office:*

2000 E. Jasper Street TULSA, OKLAHOMA Phone 4-6159


rials of smaller diameter subdivided as shown in the following table:

**CLASSIFICATION OF SOIL PARTICLES AS TO SIZE**

| Class— | Diameter of particles |
|---|---|
| Gravel and stones | 2 |
| Fine gravel | 1-2 |
| Sand | 0.05 to 1 |
| Silt | .005 to .05 |
| Clay | .005 |

The textures of soils have been defined by Marbut[18] as follows:

1. Sands include all soils containing less than 20 per cent of silt and clay.
2. Sandy loams contain 20 to 50 per cent of silt and clay.
3. Loams contain 20 per cent or less of clay and from 30 to 50 per cent of silt and from 30 to 50 per cent of sand.
4. Silt loams contain 20 per cent or less of clay 50 per cent or more of silt and 30 per cent or less of other classes.
5. Clay loams contain 20 to 30 per cent of clay, from 20 to 50 per cent of silt and from 20 to 50 per cent of sand.
6. Clays contain 30 per cent or more of clay.

The A horizon, the texture of which determines the name of the soil type, is usually less than a foot in thickness and may differ in many ways from the layers below it in which pipes are usually laid. Beneath the true soil are usually one or more layers of unconsolidated material from which the soil is being slowly formed. Pipes frequently lie partly or entirely in these horizons.

### Soil Data Available

More than 200 soil series have been named. Considerably more than one-half of the tillable area of the United States has been mapped with respect to soils. Soil reports* are issued for single counties or similar political subdivisions. Each report contains a map, which shows the location of the soil types within the area, and descriptions of the various types. The reports do not discuss the corrosivity of the soils, but some idea of their corrosivity can usually be obtained from the description of the structure and drainage of the soil and by comparison of the descriptions with those of soils in which the corrosion of pipes has been observed.

The National Bureau of Standards has conducted or supervised corrosion tests at 128 locations scattered throughout the United States. In some instances, however, two or three tests of different materials have been conducted in the same soil type. For this reason the bureau's tests furnish information directly on only about 95 soil types.

The selection of the test sites was governed to a large extent by the distribution of pipe lines and pipe networks, i.e., by the importance of the soil with respect to underground construction. Each test site represents an important soil condition, but since within an area of a few square miles several quite different soils usually exist, they are not necessarily representative of the soil conditions prevailing in the region of the site.

It should be obvious that a test of materials in any one locality may not indicate the behavior of the materials in a different soil which may lie within a short distance from the test site. Moreover, since the soil horizons of a single soil may differ widely in physical and chemical properties, degree of aeration, and moisture content, a test of pipe materials in one soil horizon may yield results different from those of a test of the same materials exposed to another horizon of the same soil type. For example, the averages of the two deepest pits on five ferrous materials buried for 5 years in Rifle peat near Plymouth, Ohio, were 38, 37, 21, 24 and 67 mils,

*Soil Survey Reports may be secured from the Superintendent of Documents, Government Printing Office, Washington, D. C.

respectively. The corresponding values for the pit depths on the same materials exposed for 7 years at the same site were 30, 34, 16, 17 and 62 mils, respectively. An examination of the site showed that the two sets of specimens were placed in two parallel trenches a few feet apart. The depths of the trenches were approximately the same, but the 5-year-old specimens were laid in the peat horizon while the 7-year-old specimens were placed in the clay subsoil which was just below the peat. The surface of the ground was level, but the thickness of the peat layer varied.

**2. Chemical properties.**

Although a very large number of chemical elements exist in soils, most of them are combined in difficultly soluble compounds which exert little chemical influence on corrosion. These inert components of soils are chiefly combinations of oxygen with silicon, aluminum and iron. Iron in various degrees of oxidation is responsible for the color of many soils, and this color is an indicator of the degree of aeration of the soil.

Chemical analyses of soils are usually limited to determinations of the composition of the solution resulting from the contact of water and soil under standard conditions. The bases usually looked for are sodium, potassium, calcium and magnesium. The acid radicals sought are carbonate, bicarbonate, chloride, nitrate and sulfate. Usually the hydrogen-ion concentration of the solution, or the total acidity of the soil, or both, are determined.

The development of acidity in soils is a result of the natural processes of weathering under humid conditions. In regions of moderate rainfall, soluble salts do not accumulate except where soil waters have seeped to lower levels and collected in depressions. However, in regions of high rainfall, not only have soluble salts been removed from the soil but the absorbed bases normally present in the colloidal material of the soil have been partially removed and replaced with hydrogen ions. This process eventually gives rise to the condition known as soil acidity. The depth to which this replacement of bases has occurred varies with rainfall, drainage, type of vegetation, and nature of the material present. The fully developed soils of the prairie region have become acid to a considerable depth, while soils whose development has been retarded by poor drainage or other conditions are alkaline and may even contain appreciable quantities of salts. East of the prairies the well developed soils are acid throughout the soil profile.

**3. Physical properties.**

The physical properties of soils which are of importance in corrosion are chiefly those which determine the aeration of the soil and its retentiveness for water. The texture of the soil, which is determined by the percentages of the particles of the various size groups, is obviously an important factor with respect both to aeration and moisture content. In soils of coarse texture, such as sands and gravels, in which there is free circulation of air, corrosion approaches the atmospheric type. However, in heavy clay soils, which are usually very retentive of water, corrosion proceeds in an atmosphere very deficient in oxygen, thereby tending to approach the condition of submerged corrosion. There are, however, differences between corrosion processes in water and in soil. Some of these occur because soils are much less homogeneous than water. Other differences occur because corrosion products diffuse more slowly in soils since convection currents and other movements of water are retarded by soil particles. Moreover, corrosion tests in water usually involve a single corrosive agent, whereas in soils several factors influence corrosion and may react on each other. For these reasons great care should be exercised in applying the results of tests in water to corrosion in soils.

Other properties of soils which are of importance in soil corrosion are air-pore space, apparent specific gravity, water-holding capacity, moisture equivalent and shrinkage. The air-pore space is the percentage of the volume of soil at a definite moisture content which is occupied by air. It is therefore a relative measure of the permeability of the soil to air. The apparent specific gravity, which is the weight of a unit volume (1 cc.) of undisturbed soil is an index of the compactness of mineral soils because the true specific gravity of the mineral particles in soils varies only within narrow limits. Moisture equivalent of a soil is defined as the percentage of water retained by a previously saturated layer of soil of given thickness when subjected to a


**RAY L. SMITH CONSTRUCTION COMPANY**
**PIPE LINE CONTRACTOR**

Modern Equipment—Operated by Experienced Pipe Liners

Now Constructing Section 7 War Emergency Pipe Line

Hazlett Building — Eldorado, Kansas

**W. G. (BILL) HANRAHAN**
**PIPE LINE CONTRACTOR**

Building—Reconditioning and Reclaiming Oil, Gas and Gasoline Lines

5500 LAMAR STREET — PHONE H-6938
DALLAS, TEXAS

**E. M. CAMPBELL & COMPANY**
*Pipe Line Contractors*

116 North Denver . . Tulsa, Oklahoma

centrifugal force of 1,000 times gravity. The moisture equivalent is a measure of the retentiveness of soils for water. The quantity of water retained by soils when equilibrium with capillary and gravitational forces has been established is approximately that given by the moisture equivalent. The volume shrinkage is a measure of the colloidal nature of the dry particles in a soil. Soils which undergo large changes in volume on drying have a disruptive effect on protective coatings. The physical properties of soils are described by Keen.[19] This publication, however, does not discuss the relations of the physical properties of soils to corrosion. The chemical and physical properties of soils, as well as their origin and classification, are discussed in the Atlas of American Agriculture[18] and Men and Soils,[20 21] but neither of these books discuss soil corrosivity.

### 4. Causes of Underground Corrosion

**1. Characteristics of ferrous pipe materials as a factor in corrosion.**

If the surface of almost any piece of steel exposed to an electrolyte is explored with a suitable pair of electrodes and a sensitive galvanometer, a number of points will be found which differ in potential. Usually these differences are less than 0.1 volt, but they may have values of several times this amount. Some of these differences in potential are the result of unequal oxidation of the surface of the metal, mill scale, strains due to shearing or hammering, nonuniform heat treatment, different kinds of crystals in the metal, inclusions of slag or other foreign material, and segregations of metal added to improve some of the physical properties of the base metal. Some of these potential differences are accidental. Others are unavoidable. Since pipes are fabricated under carefully controlled conditions, abnormal differences of potential resulting from accidents of manufacture are relatively rare and are usually unimportant when compared with the differences of potential from other sources. An outstanding example of a potential difference resulting from the inherent characteristics of the material is that between the graphite plates and ferrite grains in cast iron. Shipley and McHaffie[22] found a difference of potential of 0.5625 volt between commercially pure iron and a graphite rod in soil water having a pH value of 7.4. Another example is the potential difference between mill scale and the iron or steel upon which it is formed in the course of the manufacturing process. Both graphite and mill scale are highly resistant to corrosion and tend to protect the metal beneath them. They tend to accelerate corrosion where they are in contact with the metal in the presence of an electrolyte. Speller[14] found that centrifugally cast iron, containing 3.2 per cent of graphitic carbon, corroded slightly less than scale-free steel in warm aerated water.

In the majority of the Bureau of Standards soil-corrosion tests the pits on pit-cast iron are somewhat deeper than those on steel or centrifugally cast iron at the same test sites. These tests involve graphite flakes, foundry and mill scale, and several other variables. In a very limited number of soil-corrosion tests in which specimens of machined cast iron, wrought iron and steel were compared with specimens of the same materials from which foundry and mill scale had been removed, no definite effect of scale was found. The results of this limited test indicate that mill scale is not of great importance with respect to underground corrosion under severe soil conditions. Under such conditions the mill scale remains on the pipe only for a short time. In a 12-month test of wrought iron and steel in several waters, Wood[23] found no definite effect of mill scale. Thus, although graphite and mill scale are highly cathodic with respect to iron, their effects may or may not be important, depending on the conditions under which the iron is exposed.

The conclusions reached relative to the effects of mill scale and graphite on the corrosion rate probably apply also to foreign materials, inclusions and segregated materials. Ingot iron, which is commercially pure iron with less than 0.2 per cent impurities, pitted at approximately the same rate as other ferrous materials exposed to the same soils. Whether this result was obtained because the pure iron, as well as the other wrought materials, was exposed with the mill scale on the surface has not been determined. That soil conditions rather than the nature of the ferrous materials control the rate of corrosion is suggested by the observation that the distribution of the pits is usually similar on all the commonly used ferrous materials exposed at the same test site.

Small amounts of alloying elements have generally only small effect on the rates of corrosion of ferrous metals in soils. However, the stainless steels, and iron or steel with considerable percentages of nickel, have lower rates of corrosion, especially with respect to loss of metal.

As might be expected, nonferrous metals differ from iron and from each other in their potentials with respect to a reference electrode in adjacent soil and hence with respect to corrosion. Their relative merits for service underground will be discussed in the section dealing with the prevention of corrosion.

**2. Effects of the chemical properties of soils.**

The soluble constituents of soils affect corrosion because they control the potentials of the anodes and cathodes and the resistance of the path of the corrosion current. The soluble constituents especially the salts, furnish most of the


THE CLARENCE L. BOYD CO., INC.

Pipe Line Dirt Moving & Construction Equipment

International Tractors
Schramm Air Pumps
Trackson Side Booms
Bethlehem Wire Lines

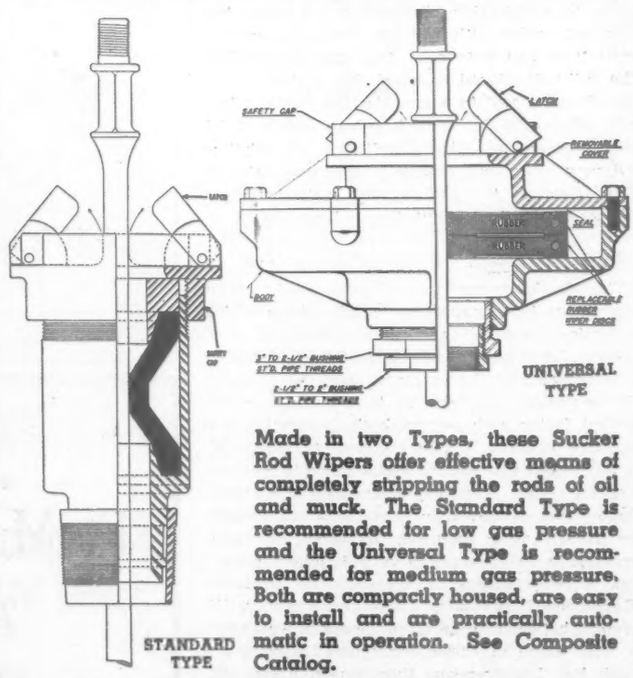
*Shovels:* Koehring, Insley
*Dirt Moving:* Adams, Bucyrus-Erie

Welding clamps, pipe hooks, brushes, canvass rugs, burners, and complete line of small pipe line supplies.

Tulsa, Oklahoma - 303 So. Frankfort
*Pipe Line Representative:*
Bo Bardsley Phone 8191 Res. Phone 9-3255
Guthrie, Oklahoma - Phone LD 1



The Most Effective Sucker Rod Wipers




Made in two Types, these Sucker Rod Wipers offer effective means of completely stripping the rods of oil and muck. The Standard Type is recommended for low gas pressure and the Universal Type is recommended for medium gas pressure. Both are compactly housed, are easy to install and are practically automatic in operation. See Composite Catalog.

PATTERSON-BALLAGH
SUCKER ROD WIPERS
PATTERSON-BALLAGH CORPORATION
Los Angeles Houston New York City

ions which carry the current. As a rule, soils containing considerable quantities of salts in solution are corrosive.

Corrosion is also affected by the reactions between the soluble salts and the primary products of corrosion, the effect on the corrosion rate depending on whether the reaction products are precipitated and on the location of the deposited products with respect to the anode and cathode of the corrosion circuit. In general, if the reactions result in the formation of soluble products, or if the products are precipitated at a distance from the electrodes, corrosion continues.

If insoluble, poorly conducting products are deposited on one or both of the electrodes, corrosion will be retarded. For example, iron continues to corrode in soils containing sodium chloride because the anodic corrosion product, ferrous chloride, and the cathodic product are both soluble. On the other hand, if calcium bicarbonate is present, difficultly soluble calcium carbonate is precipitated at the cathodic areas because of the increase in alkalinity in that region resulting from the flow of current. As a result of this deposit the current is reduced and the rate of corrosion decreases.

If iron is placed in a soil containing a soluble sulfate, corrosion progresses as in the presence of sodium chloride, but if lead is substituted for iron, corrosion ceases after a short time because of a deposit of insoluble lead sulfate.

The corrosiveness of soils is, in general, indicated by the chemical composition of the soluble material in the soils. Soils containing high concentrations of soluble salts, particularly of sodium and potassium, are usually very corrosive to ferrous metals. However, when the soluble material consists largely of calcium and magnesium bicarbonates, corrosion is relatively slight because of the formation of protective deposits of corrosion products.

Rates of corrosion are affected by the time of exposure and the area of the specimen exposed as will be discussed later. The material that is the most seriously corroded after a short exposure may last longer than another material exposed to the same soil.

The effect of acidity on the corrosion of ferrous metals in soils and in natural waters is much the same as that of salts such as sodium chloride, since the effect in both cases is to increase the solubility of the corrosion products. Baylis[26] has pointed out that the tendency of iron to go into solution would be a function of the H-ion concentration if there were rapid displacement of the solution and no tendency to form a surface coating. Whitman, Russell and Altieri[25] and Whitman and Russell[24] found that in a solution free from salts which form protective coatings, the corrosion rate of steel was unaffected by the H-ion concentration between pH 9.5 and pH 4, but was determined by the rate at which oxygen diffused to the cathodic surface, and by the protectiveness of the film formed on the metal surface. The protective action of this film in water having a pH as low as 4 was attributed to the fact that the quantity of hydrogen ions coming in contact with the metal surface was insufficient to neutralize and dissolve the film. However, when carbon dioxide was introduced rapid corrosion occurred at pH 5.4 because then the increased total acidity of the water was sufficient to neutralize the hydroxide film. This result led to the conclusion that total acidity is more important in corrosion by natural waters than is the actual concentration of hydrogen ions, i.e., the pH value.

As the acids present in soils are only slightly dissociated, the pH value of a soil may offer no indication of the capacity of the acidic material to prevent the formation of otherwise protective hydroxide films. An acid soil having a relatively high pH value and a high total acidity would be expected to be more corrosive than a soil having a lower pH value and a lower total acidity because of the greater tendency of high total acidity to prevent the formation of protective films. Denison and Hobbs[27] found a correlation between total acidity and the corrosiveness of soils with respect to steel both in the field and in the laboratory under conditions in which other causes of corrosion were nearly constant. It will be noted that in the absence of other variables the corrosiveness of the soils increased with their acidity. However, the standard deviation of the average per cent of replacements shows that even within a single type of soil the corrosion varies greatly.

**3. Effect of the physical properties of soils.**

Corrosion is retarded by the oxidation of corrosion products which produce films or thicker deposits. These deposits either reduce the differences of potentials between anodic and cathodic areas or interpose electrical resistance which reduces the corrosion current. The degree to which oxidation occurs depends largely on how readily oxygen can reach the corroding metal, which is determined by the permeability of the different soil horizons both above and below the buried metal, and the rainfall and drainage of the region. In general, the aeration of clay soils is poor, while that of sandy soils is usually good. However, low-lying sands, and sands underlain by a consolidated stratum or a hard pan layer, may be poorly aerated for long periods in regions where the rainfall is heavy.

Since the aeration of the soil, which is the chief factor in the supply of oxygen and carbon dioxide, is determined not only by the character of the soil but also by the water which the soil contains, the aeration will vary from season to season and cannot be expressed exactly or numeri-

● From the first blueprint to the finished bomber, *electric power* speeds the production lines that are making America supreme in the air.

● In every other war industry as well, Uncle Sam outproduces the Axis because he commands the greatest supply of electric power in the world.

● That tremendous power advantage didn't just happen. *Seven-eighths* of it was built up by business management under public regulation—by men with a real incentive to work, create, succeed—and by the savings of millions of Americans invested in the electric industry.

● As the industry grew under the American system of business management, it *employed* more and more people, and *served* more and more people—at lower and lower price. Today, the average American home enjoys about *twice as much electric service* as it did 10 or 15 years ago—*for the same amount of money.*

● The many other industries that make America great grew the same way—under proved and practical business management. That way of life is a part of what this country's fighting for—and a big reason why we'll win—because every one of our *133 million people has a personal stake in it!*

SOUTHWESTERN
GAS AND ELECTRIC COMPANY

cally except perhaps for some transient condition.

In well-aerated soils the rate of pitting of ferrous metals is initially very high because of the abundant oxygen supply at the cathodic areas. However, oxidation and consequent precipitation of the corrosion products in close contact with the anodic areas cause a marked reduction in the corrosion rate, with the result that the ultimate depth of pitting is relatively slight. On the other hand, in poorly aerated soils the rate of pitting, although low because of deficiency of oxygen at the cathodic areas, is relatively unchanged with time, because the corrosion products in the reduced condition are precipitated at points remote from the anodic areas. Consequently, the depths of the deepest pits after a long period are usually considerably greater in poorly aerated soils than in well-aerated soils.

Some soil water occupies the larger spaces between the soil particles, holes left by decaying roots, etc. This part of the soil moisture varies greatly with the season, rainfall and drainage. Water also adheres closely to the minute soil particles, and is removed from them and the small soil capillaries only with difficulty. On this account well-drained soils retail a certain amount of moisture through long periods of drought. There is a tendency for corrosion to increase with the moisture equivalent of the soil, but this tendency may be obscured by other factors.

### Soil Texture Important

The air-pore space is a physical characteristic of soils which depends on the texture of the soil and other properties. For well-drained soils the air-pore space indicates the supply of oxygen at any given depth and the rate at which moisture can move through the soil. Other things being equal a high value of air-pore space indicates a noncorrosive soil. The apparent specific gravity of the soil is influenced to a large extent by the amount of voids in the soil.

The volume shrinkage of soil indicates the tendency of the soil to crack on drying and to swell when wetted. The cracking of soil permits more oxygen to reach buried pipe and so affects the character of the corrosion products and the differential aeration potentials. Some soils on drying form hard clods which at times act much like stones with respect to differential aeration and pressure on pipe coatings. Some soils adhere tightly to some pipe coatings and as they shrink on drying tend to pull the coating from the pipe.[29] Some coatings are pressed into the soil cracks when the soil expands due to the absorption of water. Thus soil shrinkage is important to corrosion and pipe-line protection. In general, clay soils and soils high in organic matters shrink the most, but not all clay soils shrink greatly on drying. For example, Bell clay has a clay content of 44.9 per cent and shrinkage value of 23 per cent while Susquehanna clay has a clay content of 45.8 per cent and shrinks only 4.7 per cent. Fargo clay loam has a clay content of 70.1 per cent and a shrinkage of 21 per cent.

The physical characteristics of soils which are favorable to corrosion are poor aeration and high values for moisture equivalent, clay content, apparent specific gravity and shrinkage. These are characteristics of heavy, poorly drained soils. They are not independent of each other and their effects on corrosion may be modified by the chemical characteristics.

**4. Stray currents.**

The effects of stray electric currents from direct-current power plants and their mitigation is too large a subject to be adequately treated in this paper. The principles involves are covered in two publications,[30 31] both of which were published when stray-current electrolysis was a more frequent cause of corrosion than it is at present. Methods of detecting stray currents have been described.[32 33]

Serious corrosion is not caused by induction from power lines. Alternating current does not ordinarily cause corrosion,[34 35 29] but under some conditions alternating currents may stimulate corrosion.[9]

Corrosion from stray currents is most prevalent in the neighborhood of direct-current street railways, power houses and substations; but occasionally it occurs in regions remote from these sources of power because of an exchange of current between underground structures.

Stray street-railway current can usually be identified by irregular fluctuations which are the result of the acceleration of street cars. Measurements of difference of potential between two points on a metallic structure or between the structure and the adjacent earth made with a suitable millivoltmeter will usually determine whether stray currents are present. The discovery of the source of the current and the remedy for it is usually a difficult problem which can best be left to someone experienced in this line of work.

Recently the application of cathodic protection to pipe lines has introduced a new source of stray currents. The prevalence and seriousness of this cause of corrosion differs greatly in different parts of the country. Corrosion resulting from cathodic protection can best be eliminated by the cooperation of the utilities having adjacent pipe lines.

In the investigation of stroy-current electrolysis it is well to remember that, except for a possible heating effect, current on a metallic structure does not injure it. Corrosion occurs only at points where current flows from the structure to the earth. For this reason the potential of the structure with respect to the adjacent earth determines whether or not corrosion can occur


# PIPE LINE PROTECTION

*with*

# ROKON

An eleven-page booklet is ready for distribution showing the facts based upon experience from three years of actual commercial usage of ROKON in pipe lines carrying gasoline.

THE FIGURES SHOW:

**A.** ***Cost estimate for ROKON Feeding Installation***

**B.** ***The monetary protection given the pipe line***

ROKON, the chemical used, is sold under license of U. S. Patent No. 2,111,990 issued to The Phillips Petroleum Company.

The ROKON booklet referred to above is available upon request by pipe line operators.

**R. T. VANDERBILT CO., INC.**

230 PARK AVENUE, NEW YORK, N. Y.

at the point of observation. The potential of the pipe in question with respect to other structures is immaterial to corrosion, although it may indicate the source or carrier of the stray current.

**5. Long-line currents.**

Closely related to stray currents from street railways are so-called long-line currents. If a sufficiently sensitive millivoltmeter is connected across a few feet of almost any pipe line, a deflection will be obtained indicative of a flow of current along the line.[36] The currents vary in magnitude under different conditions and usually do not exceed a few amperes. The source or cause of these currents has been variously explained. Gish[37] associates them with magnetic storms. Putnam suggested that they may be caused by charges of electricity collected from the air by oil storage tanks or to the interaction of different soils. Shepard,[38] Mudd[39] and Weidner and Davis[40] have found rough correlations between long-line currents and pipe-line corrosion, but Gill and Rogers,[41] after a study of 9 miles of a single pipe line, decided that these currents did not influence corrosion. Stirling,[42] after studying currents on 650 miles of pipe line, concluded that long-line currents were not of such magnitude as to cause deterioration of pipe lines, but they are indicators of the location of corroded pipe.

Since most observers have made no attempt to determine the density of the current leaving the pipe, it could not be expected that they would find any close relation between the currents and the depths of the pits on the pipe. The seriousness of the corrosion caused by the discharge of current is determined not by the total quantity of current discharged, but by the quantity discharged at the area where the current density is greatest. A very small current discharged from a very small area may result in a very deep pit of small diameter while a large current discharged from a large area may remove much more metal without seriously affecting the strength or usefulness of the pipe.

Under average conditions one might expect that the discharge of long-line current would be distributed over a considerable amount of pipe surface as was indicated by the data in one of the papers[36] referred to. Consequently serious damage to pipe would not be expected to be caused by such long-line currents as have been reported.

Long-line currents on pipe lines near pump stations usually flow into the storage tanks with which the lines are connected. This is probably because of the restricted amount of oxygen which can reach the tank bottom, although it might be due to the fact that material of the tank bottom is slightly different from that of the remainder of the tank. Usually the area of the tank bottom is so large that the density of the current leaving it and the resultant rate of corrosion are very small. However, corrosion of tank bottoms is occasionally sufficiently serious to call for the application of cathodic protection.[43]

**6. Bacteria.**

The best known species which affect corrosion are the sulfate-reducing bacteria, Spirovibrio desulfuricans.[2,11] These bacteria are prevalent in many soils and have been found at great depths in wells. Their activity requires some form of a sulfate and organic material. They are said to be active only in nearly neutral solutions free or nearly free from oxygen. In the life processes of these organisms, sulfates are reduced to sulfides and hydrogen is removed from the cathodic areas on the pipe exposed to the bacteria. Authorities differ as to the details of the mechanism by which the hydrogen is removed and sulfides produced, but the net result seems to be acceleration of corrosion in two ways: (1) The depolarization of the cathodic areas and (2) the acceleration of corrosion at the anode by hydrogen sulfide. The activity of these bacteria may be recognized by an abnormal amount of iron sulfide in the corrosion products and by the odor of hydrogen sulfide when dilute hydrochloric acid is added to the corrosion products. It is also possible to prepare cultures of the bacteria and to recognize their presence by the use of a microscope or by the blackening of iron placed in the culture.

The presence of bacteria in corrosive soils has been demonstrated and may account for the observed corrosion. It may also explain some failures in soils classified by the usual tests as "not corrosive." However, no correlation has been found and no methods developed for measuring this effect.

The bacteria discussed above are anaerobic and thrive only in soils nearly free from oxygen. According to Beckwith,[12] there are also some aerobic bacteria which may cause or accelerate corrosion.

**7. Conditions incidental to pipe-line construction.**

The methods used in the construction of pipe lines are the indirect causes of much of the corrosion of the lines. Some of these causes are unavoidable. The elimination of others may be more expensive than the losses they cause. Other causes may be avoided at little expense if they are recognized by those responsible for the laying of the line.

**(a) Causes of corrosion incidental to backfilling.**

One of the most prevalent causes of corrosion of crosscountry lines is differential aeration resulting from the way in which the soil is replaced in the trench. Heavy soils frequently form large hard clods when they dry out after being removed from the trench. When these are scraped back by a bulldozer or other machine, voids are formed beneath the lower shoulder of the pipe which persist for long periods. Other voids occur


WE are *purchasers* of abandoned *pipe lines*, in or out of the ground, *oil wells*, *steel buildings* and steel storage *tanks* of all sizes.

JOS. GREENSPON'S SON PIPE CORP.

(Pipe for Every Purpose)

NATIONAL STOCK YARDS,
St. Clair Co., ILLINOIS



*for* QUICK REPAIRS

in DEFENSE EMERGENCIES!

For wartime emergency-breaks in pipe lines, this Doublex Simplex Split Sleeve will enable you to make quick, economical, effective repairs. You should have a supply of several of each different size that you might need. Thousands in use, some for 13 years. Order now from shipping point nearest to you as follows: Birmingham, Dallas, Kansas City, Los Angeles, Minneapolis, San Francisco, Pittsburgh.

AMERICAN CAST IRON PIPE CO.

BIRMINGHAM, ALA.

Dallas Houston El Paso Kansas City Los Angeles San Francisco
Chicago Minneapolis New York City Cleveland Pittsburgh

between clods which meet along the upper shoulders of the pipe, while still others occur because of the unevenness of the trench bottom and because of bends in the pipe. Differential aeration also occurs when more porous soil particles fill spaces between the denser clods. It has already been pointed out that comparatively high potential differences may result from differential aeration. Potential differences also result from backfilling with soils from horizons differing in texture and chemical composition. Some pipe-line operators have avoided these causes of corrosion by placing a layer of sand next to the pipe. Others use water or tamp the backfill, but these measures are usually adopted to avoid settling of the backfill, and any mitigation of corrosion is incidental.

Occasionally serious corrosion has occurred because of stones, sticks or other foreign material which were allowed to come in contact with the pipe when the trench was backfilled.

**(b) Potential differences between soils and between soil horizons.**

Inspection of almost any soil-survey map will show that within a few miles a pipe line may traverse several soil series. These soils may differ widely in many of their properties, such as chemical composition, texture, moisture content and aeration. In much the same way the pipe line may encounter different soil horizons because it is not laid at a uniform depth below the surface of the ground or because the soil horizons vary in thickness or because the diameter of the pipe is large. The different soils or soil horizons may differ in their potentials with respect to the pipe and so cause corrosion. It would be difficult to determine whether these potential differences were the result of differences in chemical composition of the soils or differential aeration resulting from differences in texture or moisture.

**(c) Interconnection of different metals.**

As has been indicated, a difference of potential exists between almost any two metals or between two varieties of the same metal. In the case of some combinations of ferrous and nonferrous metals the difference of potential is large. Whether serious corrosion occurs depends on the reactions which take place. In many cases an oxide or other film forms on one of the metals and prevents serious corrosion. In other cases the area of the anodic material is so large in comparison with the cathodic area that either the corrosion is distributed over a large area or cathodic polarization reduces the corroding current to a negligible quantity. It is standard practice to screw brass corporation cocks into cast-iron water mains, and little or no corrosion has resulted from the practice. A few cases of corrosion of steel attached to copper service pipe have been reported.

Serious corrosion of iron parts of valves with brass seats exposed to rapidly flowing sea water has occurred. In this case it seems probable that the movement of the water depolarized the cathodic metal.

The relative positions of two metals in the electromotive or electrochemical series is not a dependable criterion for the extent of the corrosion resulting from the contact of the two metals in an electrolyte such as soils or natural waters. It is advisable, however, in so far as other conditions permit, to avoid metallic contacts between metals far apart in the series if the joint is exposed to an electrolyte.

**(d) Interconnection of old and new pipe.**

Especially in the transportation of petroleum it is customary to supplement the pipe line first laid with newer parallel lines, all the lines being metallically connected at the pump stations. Measurements have shown[25] that if an old pipe line is paralleled by a newer line, the newer line will remain anodic to the older line for several years at least, if the two lines are interconnected. Interconnection of the two lines evidently accelerates the corrosion of the newer line and tends to prolong the life of the older one. This may explain some cases in which the original line outlasted a newer line which paralleled it. In most cases the current flowing from the newer line is discharged from so much of its surface that the corrosion on this account is not serious.

## 5. Identification of Corrosive Soils

The identification of corrosive soils may be undertaken for two different, although related, purposes: (1) To determine whether the character of a sample of soil from a selected spot is such as to account for the corrosion observed at that spot and (2) to determine whether the soils along a pipe-line right-of-way are sufficiently corrosive to justify the application of protective measures to an actual or proposed pipe line. The study of individual samples of soil will be discussed under the heading "soil tests" and the more extended investigation under the heading "soil surveys." It should be noted that both of these studies assume that some soil properties are responsible for the corrosion observed or anticipated. It follows that the results of the studies can be satisfactory only in so far as the assumption is correct.

**1. Soil tests.**

The earliest tests for the corrosivity of soils were probably chemical analyses of soils or soil extracts. In regions where the rainfall is moderate or high, the soluble material remaining in the soil is very limited and chemical analyses have thrown little light on the cause of corrosion except in cases of contamination by factory waste or some similar cause. In the more arid regions some of the soils contain considerable percentages of soluble salts, and chemical analyses of soils of these regions have been more useful. Since the electrical conductivity of the soil

WAR is making unprecedented demands upon the oil industry and banks of America. Producers, marketers, suppliers, transporters — all will find our facilities geared to the faster pace of wartimes. We stand ready to serve every branch of the industry — with least possible delay.

REPUBLIC NATIONAL BANK
OF DALLAS
MEMBER FEDERAL DEPOSIT INSURANCE CORP.
ONE OF THE NATION'S 100 LARGEST BANKS

depends in part on the concentration of soluble salts, measurements of electrical conductivity or resistivity are widely used in locating soils that are corrosive with respect to iron. These measurements do not differentiate between the salts in the soil and therefore do not take account of their film-forming properties. Soil-resistivity measurements probably would not indicate the corrosivity of soil with respect to lead.

The earliest apparatus for this purpose was probably the electrolytic bridge.[44] This method was developed for determining the quantity of salts in soils rather than for determining soil corrosivity, and it has not been used extensively for the latter purpose. Based chiefly on the conductivity of the soil, but bringing into consideration some other factors is the Williams-Corfield nipple-and-can test,[45] which is extensively used especially on the Pacific Coast where it was developed. According to this method a weighed 4-in. length of ¾-in. iron pipe is placed vertically in the center of a tin can 3 in. in diameter filled with the soil to be tested in a saturated condition. A six-volt battery is connected between the pipe and the can for 24 hours, and the loss of weight is determined. Corfield compared the losses determined in this way with the relative corrosivity of soils taken from locations where he had measured pit depths, and so calibrated his apparatus in terms of probable pipe life.

More recently Denison[1 46] developed an electrolytic method for testing soils which is somewhat less arbitrary and includes a larger number of variables. The method has been used extensively at the Bureau of Standards and to a slight extent elsewhere. It requires somewhat more apparatus than other methods and requires more time than some of them. The method has been modified from time to time.

One of the most important weaknesses of all soil tests is the inadequacy of the sample. If a single small sample is tested, the best result that can be hoped for is the corrosiveness of the sample. This may or may not be representative of any considerable amount of soil, and in many tests the physical condition of the sample is not that of the soil to which the buried metal is exposed. If a large sample is tested, or if a large number of samples are taken and mixed or tested separately, the final result at best represents the average corrosiveness of the samples, and in the case of the latter procedure, the dispersion of the individual results with respect to the average. The same line of reasoning is applicable to the tests of materials by exposing them to soils. By tests of soils or of materials exposed to soils a rough idea of corrosiveness of resistance to corrosion may be obtained, the reliability of which depends on the extent to which conditions of the test are representative of field conditions. As bases for predictions of average field results, adequate test results are of great value, but they are unreliable as indications of what will happen in any individual case of exposure of metal to soil unless the test and the exposure conditions are known to be identical in all essential respects.

**2. Soil corrosivity surveys.**

A soil corrosivity survey may be made to ascertain whether a pipe line already laid is corroding seriously at certain points or to determine what sections of a line laid or projected should be protected against corrosion. It is accomplished by a series of tests of samples of soil selected as representative of conditions both as to extent and corrosivity. Its usefulness depends to a large extent on the accuracy of the sampling in these respects, and frequently too little attention is paid to this question. The same soil types frequently occur at several places along a long pipe line or right-of-way and the number of tests may be reduced by first determining the location and extent of each soil type and then obtaining an adequate number of samples from each type instead of taking samples at equally spaced intervals. It will usually be found that some soil types are corrosive while others are not. Under such conditions a coating or reconditioning policy for a pipe line is preferably based on the soil type as the unit. If the coating or reconditioning of a line is limited to a few types of treatment, it is usually sufficient to divide the soils into a somewhat larger number of groups with respect to corrosiveness.

Since the group boundaries are arbitrary and each soil merges into the adjoining soils, it is frequently considered that a soil test is satisfactory if it comes within one group of placing the tested sample in the correct group, that is, if the soil actually belongs in group three with respect to corrosiveness the purposes of the survey will have been accomplished if the test places the sample in Group 2, 3 or 4. However, a satisfactory corrosion test should assign the majority of the soils to the correct group.

Since it is unusual in many parts of the country to find any one soil series extending continuously in one direction for a distance of a mile, and since many pipe lines or sections of lines extend a hundred miles or more, a soil survey to be adequate must involve a large number of tests. It follows that the time required for a single test is an important consideration. Usually a large number of approximately correct results are more useful in the protection of a long line than a few accurate results, because a single test usually shows the condition of only a small part of the line.

The Shepard soil-resistivity meter[38] is probably the instrument most frequently used for soil-survey work because of its low cost, simplicity, and the speed with which measurements can be made.

THE DURAMETALLIC TWIST

1. Processed to retain lubrication.
2. Provides readier response to gland pressure.
3. Distributes frictional load over several diagonally wrapped metallic sheets.
4. Originated by DURAMETALLIC.

**THERE'S A WAR TO BE WON!**

**Pump room performance is important! This is no time to handicap the efficiency of your pumps with make-shift packing . . . specify DURAMETALLIC twisted, flexible metallic packing and be assured of long runs, better sealing and friction-free service.**

*Write Today for* SPECIFIC RECOMMENDATIONS ON THE RIGHT TYPE PACKING FOR YOUR NEEDS

DURAMETALLIC The PERFECT SEAL CORPORATION

KALAMAZOO MICHIGAN

HOUSTON • LOS ANGELES • CHICAGO • NEWARK • NEW ORLEANS • DETROIT
SAN FRANCISCO • SEATTLE • TULSA • MONTREAL • YOUNGSTOWN, O. • FREDERICKSBURG, VA. • KANSAS CITY • MINNEAPOLIS

The apparatus consists of two small steel electrodes on the ends of insulating rods. The rods are thrust into the soil to the depth at which the resistivity of the soil is desired. This is usually accomplished through the use of a soil auger or a steel bar driven into the soil unless a trench is available. Between the electrodes is connected a milliammeter and a small dry cell. The milliammeter is calibrated in terms of the voltage of the cell divided by a constant times the current, i.e., in terms of resistivity. The instrument only measures roughly the resistivity of the soil near the electrodes at the time of the test. For this reason a large number of tests should be made. If the soil is very dry or gravelly the results are unsatisfactory. If the resistivities of the soils are high, say above 1,000 ohm-cm., a decrease in resistivity may be more indicative of a corrosive area than the magnitude of the resistivity. Usually soils having resistivities less than 500 ohm-cm. are seriously corrosive, either because they are wet or because they contain large percentages of salts in solution. There are several other instruments which measure soil resistivity with greater accuracy. However, the relation between soil corrosivity and resistivity is not close enough to justify any considerable expenditure of time or labor in order to obtain better than approximate values of resistivity.

### 6. Criteria for Corrosion and Corrosivity

**1. Basis for determining corrosion.**

Comparisons of the corrosiveness of soils and the resistances of materials to corrosion are unsatisfactory partly because there is no recognized standard. As might be expected, different bases yield different results. Among the criteria are loss of electrical conductivity, loss of strength, time required for corrosion products to become visible, maximum or average penetration, time required for the development of a leak in a container such as a pipe, and life of pipe or other structure.

Study of these proposed measures of corrosion shows that most of them require some rather arbitrary specifications which limit their applicability to a circumscribed field. For sewer pipes and culverts crushing strength is of primary importance, and small isolated pits or punctures have little immediate significance. For lines carrying oil, water, or gas, pits are unimportant except in so far as they indicate how soon leaks are to be expected, and this cannot be estimated from pit depths alone. The importance of a leak depends on the cost of repairing it and the damage resulting from it. Different companies estimate the cost of a leak from $50 to more than $1,000. The life of a pipe may be the time required for the development of a single leak in a unit length or the time required for its condition to be such that additional repairs would be unprofitable. Many pipe-line operators maintain that although sections of a pipe line may require repairs or renewal, the life of the line as a whole is limited only by the need for the line.

For purposes of valuation the condition of a pipe line is frequently expressed as a percentage of the value of a new line. Here again there is a difference of opinion and a distinction between present value or usefulness and the length of time the usefulness will continue. Some operators contend that the purpose of a pipe line is to conduct a fluid, and that so long as a line will do this without a decrease in carrying capacity, the value of the line is not affected by the extent to which it is corroded.

**2. The effect of time and exposed area on the relative merits of materials.**

It has already been explained that rates of corrosion change with the period of exposure and that the change in rate is different for different materials and for different conditions of exposure.[48] On this account, rates of corrosion, however expressed, have little usefulness if materials are to be compared. An analogous situation exists with respect to the relation of maximum pit depths, leaks, or life of pipe to the area of the specimen or pipe under consideration.[3] Since corrosion is far from uniform, the greater the exposed area the shorter will be the time until a leak develops within that area, or the greater will be the total number of leaks after a given time. The pit depth-area relation depends on the irregularity of corrosion and differs for different materials and soil conditions.

From the foregoing considerations, it follows that if two materials are to be compared, they must be exposed not only to the same soil conditions, but they must also have the same exposed areas and be exposed for the same time. Otherwise adjustments which take account of these variables must be made. The difficulties involved in meeting these conditions greatly limit satisfactory comparisons of materials. Anyone desiring to compare materials should first determine whether his data meet the conditions for correct comparisons. If the conditions with respect to equal time of test and equal areas are met, the relative merits of the materials in soils may be different for other times and areas, especially if the times are short and the areas small.

On account of the effects of time and area on the data obtained from corrosion tests, it has been proposed[49] that corrosion in soils be expressed by an equation having three variables, the first representing the corrosion after some arbitrary period of exposure, the second expressing the effect of the period of exposure, and the third expressing the effect of area.

The use of such an equation would permit the comparison of materials or soils under any chosen conditions with respect to time and area of exposure. It would also permit the estimation of the number of leaks to be expected in any length


"VAREC" TANK EQUIPMENT ASSURES

Maximum SAFETY with Minimum VAPOR LOSS

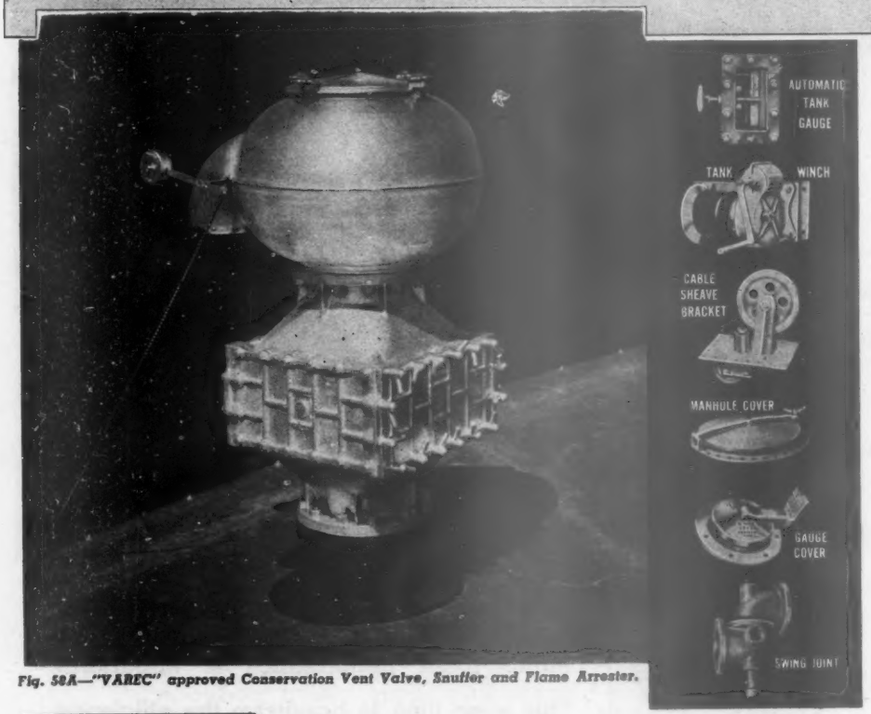



*Fig. 58A—"VAREC" approved Conservation Vent Valve, Snuffer and Flame Arrester.*

**"VAREC" Products:—**

Conservation Vent Units - Flame Arresters - Weatherhoods - Safety Vents - Relief Valves - Regulators - Gastight Tank Gauges - Sampling Units - Manhead Covers - Swing Joint Assemblies - Sediment and Drip Traps - Check Valves - Flame Checks.

THE PACE SETTER SINCE 1929

IN Pipe Line Terminals, Oil Fields and Refineries, "VAREC" approved Vapor Recovery and Tank Equipment is safely controlling combustible gases from volatile liquids such as Butadiene, Butane, Toluol and High-Octane Aviation Gasoline. Petroleum engineers specify "VAREC" Equipment STANDARD for the handling of all toxic and combustible gases economically and efficiently. "VAREC" Laboratory and Engineering Department will collaborate with you on all gas venting problems.

The new "VAREC" Tank Equipment, Gas Control and Safety Devices Catalog P-7 will soon be off the press. Profusely illustrated with flow diagrams, service installations, product description, and engineering data, it is a valuable asset to your library.

**The Vapor Recovery Systems Company**

COMPTON, CALIFORNIA

Branch Offices and Stocks carried at: NEW YORK CITY; HOUSTON, TEXAS; TULSA, OKLAHOMA. Agencies Everywhere.

of pipe after any period of service providing no part of the line had been renewed.

## Summary

There are a large number of sources of potentials which cause the corrosion of buried metal. The seriousness of corrosion underground depends largely on the character of the films or thicker deposits resulting from corrosion processes. Poor material is not an important cause of underground corrosion. The chemical composition of the soluble material in soils is an important factor in corrosion but when the soil contains only small percentages of soluble salts other factors control the rate of corrosion. Well-drained soils are usually noncorrosive. Wet soils, organic soils, and soils high in soluble salts are usually corrosive. Stray currents cause corrosion only when they flow from metal to an electrolyte, usually the earth. Only direct currents cause corrosion under normal conditions.

There is no standard or generally accepted criterion for corrosivity or corrosion resistance. The relative merits of materials with respect to corrosion may change the time of exposure, the area exposed, and the conditions of exposure.

Usually most of the commonly used ferrous materials, including many low-alloy steels, corrode at nearly the same rates when exposed to the same soil conditions. Lead corrodes slowly in most soils because of the formation of protective layers of carbonate and sulfate. Copper and alloys high in copper corrode much more slowly than ferrous materials in most soils. Copper is much more affected by soils containing hydrogen sulfide.

Cathodic protection properly applied and maintained is an effective means of preventing corrosion. Under some conditions a combination of a protective coating and cathodic protection affords the most economical means of preventing corrosion.

## References

1. I. A. Denison, Observations on the Behavior of Steel Corroding Under Cathodic Control in Soils, Trans. Electrochem. Soc. 76, 199, 1939.

2. Kirk H. Logan, Engineering Significance of National Bureau of Standards Soil Corrosion Data, J. Research NBS 22 109 (1939) RP1171.

3. R. F. Hadley Studies in Microbiological Anaerobic Corrosion, Proc. AGA, 964 (1940).

4. E. P. Fetherstonhaugh, Discussion of Underground Corrosion, Proc. Am. Soc. Civil Eng. 101, 828 (1936).

5. J. F. Brennan, A Mathematical Theory of Corrosion, Gas Age Record, 75, 359 (1935).

6. N. L. Hoff, The Corrosion-Time Relationship for Underground Pipes, Gas Age 80, 35 (1938).

7. G. N. Scott, A Preliminary Study of the Rate of Pitting of Iron in Soils, Proc. A.P.I. 14 (4), 212 (1933).

8. J. F. Putnam, Soil Corrosion, Proc. A.P.I. 16 (4), 66 (1935).

9. U. R. Evans, Metallic Corrosion Passivity and Protection, 2nd edition (1937); Arnold (London).

10. E. R. Shepard, Some Factors Involved in Soil Corrosion, Ind. & Eng. Chem. 26, 723 (1934).

11. O. A. H. von Wofzogen Kuhr and L. S. van der Vlugt, The Graphitization of Cast Iron as an Electro-Biological Process in Anaerobic Soils, Water (Dutch) 18, No. 16, 147.

12. T. D. Beckwith, The Bacterial Corrosion of Iron and Steel, Jour. A.W.W.A., 33, No. 1, 147.

13. R. M. Burns, The Corrosion of Metals I., Bell System Technical Journal, 15, 20 (1936).

14. F. N. Speller, Corrosion, Causes and Prevention, 2nd edition, McGraw-Hill Company (1935).

15. T. P. Hoar, The Principles of Metallic Corrosion, The Science of Petroleum, p. 2307, Oxford University Press.

16. C. F. Marbut, Atlas of American Agriculture, Part 3. Soils of the United States, Government Printing Office (1935).

17. Mark Baldwin, C. E. Kellogg, and James Thorp, Soil Classification, Soils and Men, 979, U. S. Government Printing Office (1938).

18. Soil Survey of Baltimore County, Maryland, Government Printing Office (1919).

19. B. A. Keen, The Physical Properties of the Soils, Longmans Green & Co., New York (1931).

20. T. D. Rice, L. T. Alexander, The Physical Nature of the Soil. Soils and Men, 887, U. S. Government Printing Office (1938).

21. H. G. Byers, M. S. Anderson, Richard Bradfield, General Chemistry of Soils, Soils and Men, U. S. Government Printing Office (1938).

22. J. W. Shipley and Ivan R. McHaffie, Relation of Hydrogen in Concentration to the Corrosion of Iron, Canadian Chemistry and Metallurgy 8, 121 (1924).

23. W. P. Wood, Corrosion of Rusted Proofed Iron and Steel, Chem. & Met. Eng. 28, 772 (1925).

24. J. R. Bayliss, Prevention of Corrosion and Red Water, J. Am. Water Works Assoc. 15, 596 (1926).

25. W. G. Whitman, R. P. Russell, and V. P. Altieri, Effect of Hydrogen Ion Concentration on Submerged Corrosion of Steel, Ind. & Eng. Chem. 16, 665 (1924).

26. W. G. Whitman and R. P. Russell, The Submerged Corrosion of Iron, Soc. Chem. Ind. 43, 1031 (1924).

27. I. A. Denison and R. B. Hobbs, Corrosion of Ferrous Metals in Acid Soils, J. Research NBS 13, 125 (1934) RP696.

28. I. A. Denison and S. P. Ewing Corrosiveness of Certain Ohio Soils, Soil Science 40 287 (1935).

29. G. N. Scott, The Use and Behavior of Coatings Underground. Proc. A.P.I., Vol. 10, Sec. 1, p. 78.

30. E. B. Rosa and Burton McCollum. Electrolysis and Its Mitigation, Technologic Paper BS 52 (1915).

31. Report of the American Committee on Electrolysis 1921. The American Institute of Electrical Engineers, New York.

32. Burton McCollum and K. H. Logan, Electrolysis Testing, Technologic Paper BS 355 (1927).

33. J. M. Pearson, Electrical Instruments Applied to the Study of Pipe Line Corrosion, A.P.I. Proc. 16 (4), 75 (1936).

34. E. R. Shepard, Electrolytic Corrosion of Lead by Continuous and Periodic Currents, Am. Electrochem. Soc. Trans. 39, 23 (1921).

35. Anonymous, Alternating Current Does Not Damage Water Pipes, Power Plant Engng. 44, 62 (1940).

36. K. H. Logan, Walter Rogers and J. F. Putnam, Pipe Line Currents, A.P.I. D. and P.E. Bulletin 204, 118 (1930); Gas Age Record 64, 899.

37. O. H. Gish, The Nature of Electric Currents in the Earth, Scientific Monthly 32, 5 (1930).

38. E. R. Shepard, Pipe Line Currents and Soil Corrosivity as Indicators of Local Corrosive Areas, J. Research NBS 6, 683 (1931) RP298.

39. O. C. Mudd, Detecting Pipe Line Corrosion With Electrical Devices, The Oil and Gas Journal, 38, No. 5, 48 (1939).

40. C. R. Weidner and L. E. Davis, Relation of Pipe Line Currents and Soil Resistivity to Corrosion, A.P.I. Proc. 12 (4) 36, 30, No. 26 41 (1931).

41. Stanley Gill and Walter Rogers, Relation of Long Line Currents to Corrosion, Physics, 1, No. 3, 194 (1931).

42. J. Campbell Stirling, Pipe Line Currents, The Oil and Gas Journal, 37, No. 19, 142 (1938).

43. D. H. Bond, Cathodic Protection of Oil Storage Tank Bottoms, Petroleum Eng. (March 1940).

44. R. O. E. Davis, The Use of the Electrolytic Bridge for Determining Soluble Salts, Department of Agriculture Circular 423, U. S. Department of Agriculture (1923).

45. Guy Corfield, Running a Soil Corrosion Survey, Western Gas 6, 3, 25 (1930).

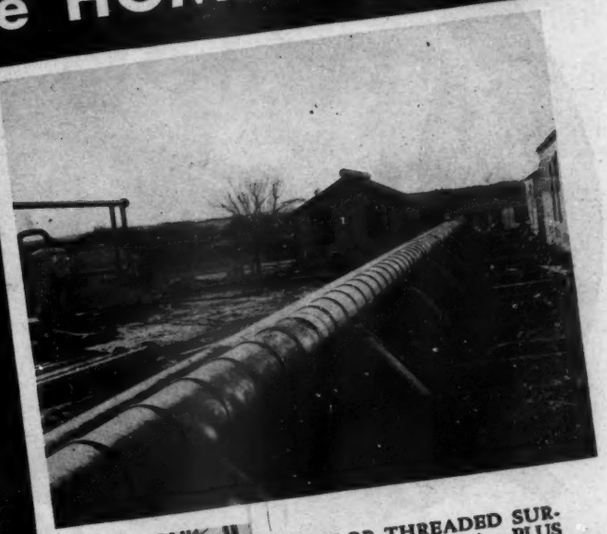
46. I. A. Denison, Electrolytic Measurement of the Corrosiveness of Soils, J. Research NBS 17, 363 (1936) RP918.

47. K. H. Logan and E. A. Koenig, Comparison of Methods for Estimating Soil Corrosivity, A.P.I. Proc. 20 (4), 25 (1939).

48. K. H. Logan, S. P. Ewing, and I. A. Denison, Soil Corrosion Testing, A.S.T.M. Symposium on Corrosion Testing Procedures (1937).

NAYLOR light-weight PIPE
For Vital Lines
on the HOME FRONT

LIGHT IN WEIGHT
SAVES STEEL
STRONGER · LEAK-TIGHT · SAFER
SPEEDS INSTALLATION
IDEAL FOR VACUUM SERVICE
SAVES MONEY



These are only a few reasons why you should look to Naylor for steel-saving, money-saving line pipe. Sizes from 4" to 30" in diameter—thickness from 14 to 8 gauge—all types of fittings, connections and fabrications.

Call our distributor or write for catalog

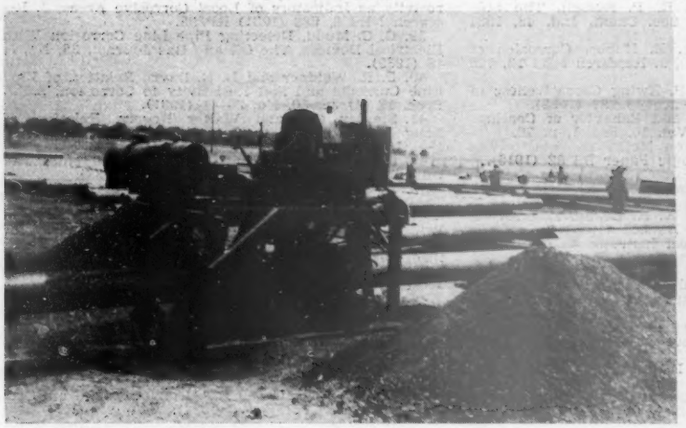
NAYLOR THREADED SURFACE CASING also gives PLUS advantages. No joint welding or field welding equipment required. The Spiral helps centralize Naylor Casing in the hole—helps prevent channeling—insures a better cementing job. Uniform lengths, light weight and accurate threading speed handling and setting—save money. Sizes 13⅜" O.D. to 20" O.D. Interchangeable with A.P.I. standard casing.

YOUR DEPENDABLE SOURCE OF SUPPLY
FOR LINE PIPE AND SURFACE CASING

NAYLOR PIPE COMPANY
1232 East 92nd Street, Chicago, Ill.

MID-CONTINENT SUPPLY COMPANY
Fort Worth, Texas and Branches

Exclusive Distributors in Arkansas, Kansas, Louisiana, New Mexico, Oklahoma and Texas.



*Left: Old pipe going through cleaning machine. Right: Stamping down pipe across rice field with three tractors and men*

**uicker deliveries**

**. . . better service!**

**NOW AVAILABLE ON W-S HAND PUMPS AND JACKS**

To meet your war-time need for quick service and prompt deliveries, W-S is now turning over to Mill Supply Distributors its complete lines of Hand-Operated, High-Pressure Pumps, and Hydraulic Jacks.

W-S Hand Pumps and Jacks are now as near as your telephone. For full information, inquiries or orders, call your regular Mill Supply Distributor.

**GET THESE NEW, FREE BULLETINS NOW... *Use Coupon***

Bulletin 240-A (Hand Pumps): illustrates and describes 6 types of Single Plunger and Double Plunger Pumps with and without built-in reservoirs; 23 pressure ratings from 1,500 to 10,000 lbs. per sq. in. Used for operating Hydraulic Jacks, small Hydraulic Presses, for general testing purposes, etc.

Bulletin 710-A (Jacks): illustrates and describes Independent Pump Jacks (11 capacity ratings from 10 to 500 tons, four sizes for each rating) Vertical Outside Pump Jacks (9 capacity ratings and sizes from 60 to 200 tons) and Horizontal Outside Pump Jacks (5 capacity ratings from 60 to 200 tons).

Distributor Products Division
THE WATSON-STILLMAN CO.
ROSELLE, N. J.
Engineers and Manufacturers of Forged Steel Fittings and Valves • Hydraulic Machinery and Equipment • Hydraulic Presses, Pumps, and Jacks

*Distributor Products Division*
THE WATSON-STILLMAN CO., Roselle, N. J.
Please send me the following Bulletins immediately { Bulletin 240-A (Hand Pumps) / Bulletin 710-A (Jacks)

Name _____ Title _____
Company _____
Address _____
City _____ State _____

OGJ-753


# Old Pipe Used For Gas Line in Coastal Area

**By F. L. SINGLETON**

THE Houston Pipe Line Co. recently placed in operation a 41-mile 12¾-in. gas line from the Katy gas field, Waller County, Texas, to Pearland, Tex., in Brazoria County, where it ties into the company's main 16-in. carrier. The line was laid for the purpose of increasing the capacity of the company's natural-gas facilities to meet fuel requirements of the expanding war industries in the Gulf Coast area. While the construction of this line involved no unusual problems, the project is significant as it was constructed entirely of reconditioned pipe which had been salvaged from old abandoned feeder lines at various points in the lower end of the company's system in Southwest Texas.

Contract for digging up and laying of the line was let to Latex Construction Co., while contract for the reconditioning work was let to Mayes Brothers, Inc., of Houston, Tex. Facilities of both companies were coordinated in such a manner that the entire project was one continuous operation.

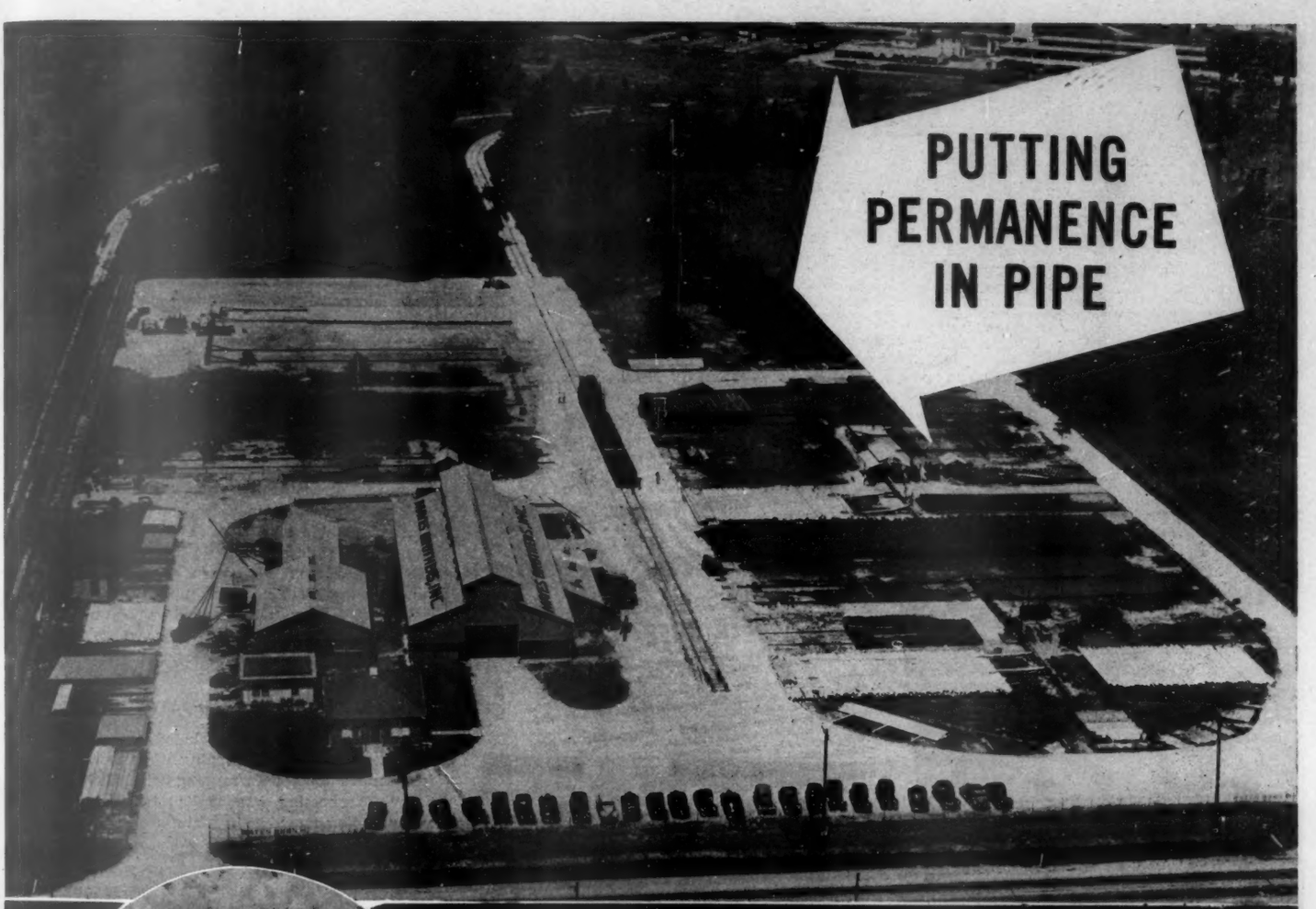
The pipe was dug up and assembled at four locations, and hauled to the righ-of-way by a fleet of trucks. Twelve miles was dug up in the old Carolina-Texas field, Webb County, a distance of about 300 miles from the main right-of-way; 25 miles was taken up in the Refugio area, Refugio and Victoria counties; 9 miles was removed from the old White Point area, San Patricio County; and 7 miles from Old Gulf in Matagorda County. The average distance from the latter three locations was 100 miles. This pipe was laid in 1927 and 1930 with couplings in 20-ft. joints.

## Central Reconditioning Yard

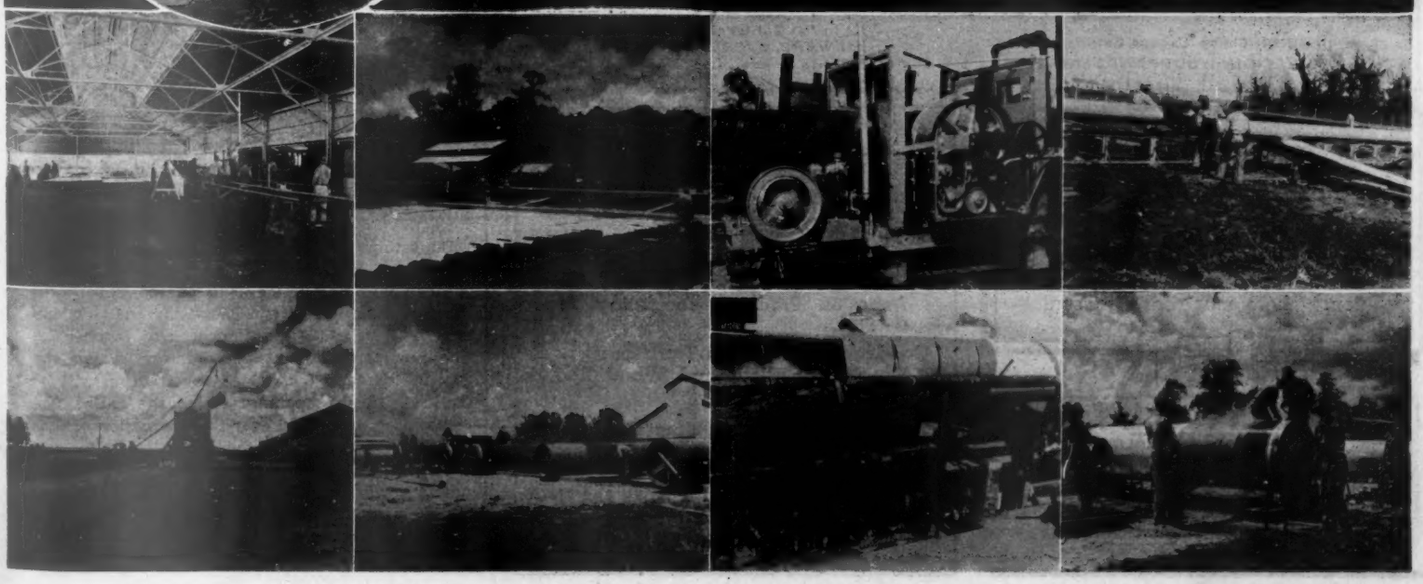
The most interesting phase of the project was the reconditioning work at a centralized yard which was set up on a 12-acre tract at Missouri City, located on the right-of-way about midway between Katy and Pearland. To facilitate handling of the pipe, the yard was laid out so that as the pipe was unloaded from the trucks it could be reconditioned and moved to the right-of-way in one complete "assembly line" type of operation.

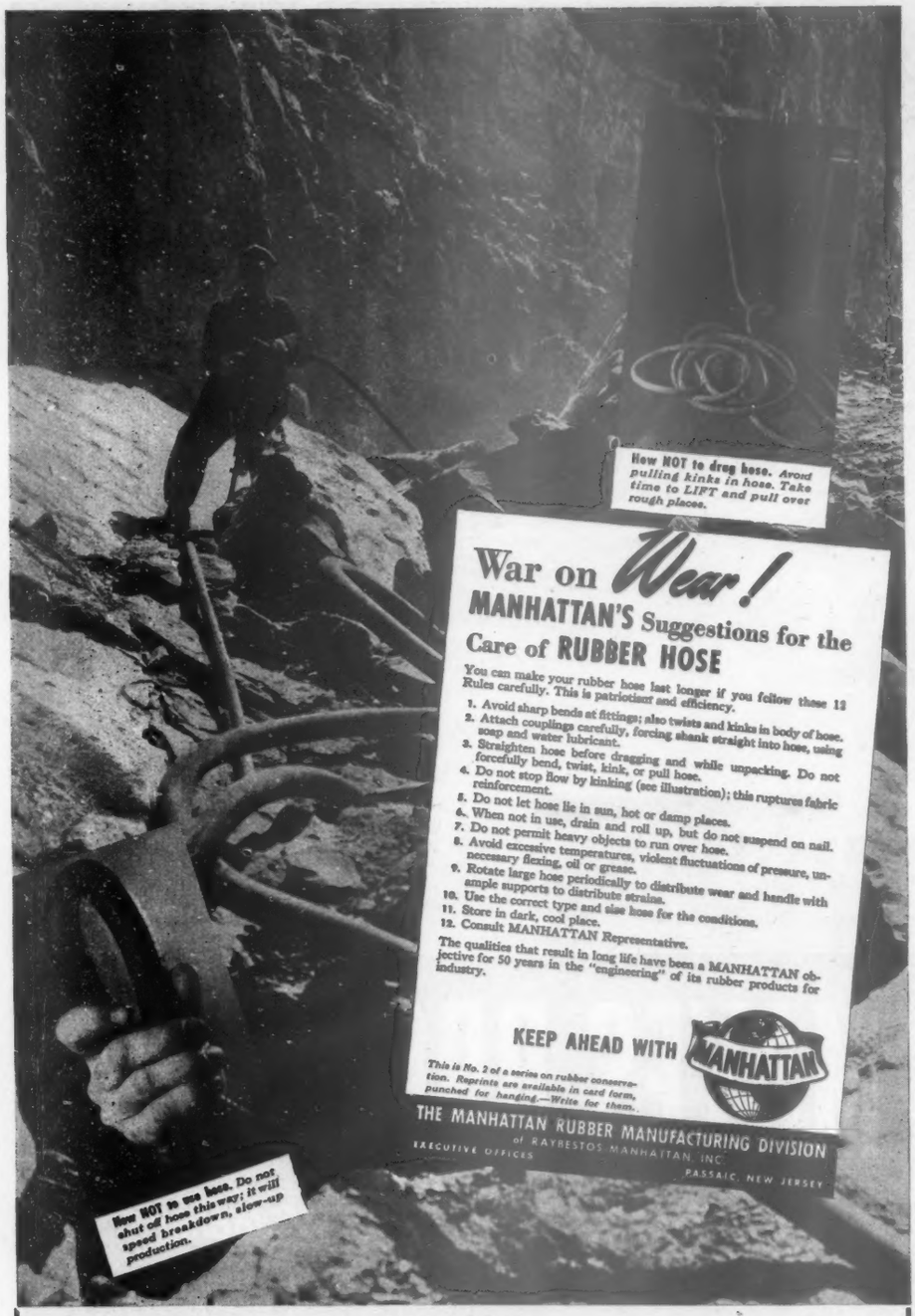
Equipment used in the reconditioning work included three welding machines, three air compressors, three 10-drum tar pots, one K.K.M. cleaning machine, one complete stationary-type coating-and-wrapping machine, one tractor and three auxiliary trucks. Water throughout the yard was furnished by a 50-ft. well which was drilled at the time the yard was set up, while a complete butane system was installed for fuel and for drying sand for the blasting machine.

Due to the length of service of the pipe it was



MAYES BROTHERS
INC.
*Pipe Cleaning, Coating and Wrapping*
HOUSTON, TEXAS




How NOT to drag hose. Avoid pulling kinks in hose. Take time to LIFT and pull over rough places.
War on Wear!
MANHATTAN'S Suggestions for the Care of RUBBER HOSE
You can make your rubber hose last longer if you follow these 12 Rules carefully. This is patriotism and efficiency.
1. Avoid sharp bends at fittings; also twists and kinks in body of hose.
2. Attach couplings carefully, forcing shank straight into hose, using soap and water lubricant.
3. Straighten hose before dragging and while unpacking. Do not forcefully bend, twist, kink, or pull hose.
4. Do not stop flow by kinking (see illustration); this ruptures fabric reinforcement.
5. Do not let hose lie in sun, hot or damp places.
6. When not in use, drain and roll up, but do not suspend on nail.
7. Do not permit heavy objects to run over hose.
8. Avoid excessive temperatures, violent fluctuations of pressure, unnecessary flexing, oil or grease.
9. Rotate large hose periodically to distribute wear and handle with ample supports to distribute strains.
10. Use the correct type and size hose for the conditions.
11. Store in dark, cool place.
12. Consult MANHATTAN Representative.
The qualities that result in long life have been a MANHATTAN objective for 50 years in the "engineering" of its rubber products for industry.
KEEP AHEAD WITH MANHATTAN
This is No. 2 of a series on rubber conservation. Reprints are available in card form, punched for hanging.—Write for them.
THE MANHATTAN RUBBER MANUFACTURING DIVISION
of RAYBESTOS MANHATTAN, INC.
EXECUTIVE OFFICES
PASSAIC, NEW JERSEY
How NOT to use hose. Do not shut off hose this way; it will speed breakdown, slow up production.

DISTRIBUTORS

In All Oil Fields Except California
THE NATIONAL SUPPLY COMPANY

In the California Oil Fields
HOWARD SUPPLY COMPANY
5125 Santa Fe Ave., Los Angeles, Calif.

UNIBOLT
*"BIG INCH"*
COUPLINGS
Are more widely used on pump suctions than any other connection. There must be a reason!

UNIBOLT
THE ONE BOLT COUPLING

THORNHILL-CRAVER COMPANY
HOUSTON

R. B. HALL & COMPANY
SALES AND ENGINEERING
Magnolia Building — Phone Central 6061
DALLAS, TEXAS

Ruberoid, Asbestos Pipe Line Felt.
Corrugated Asbestos Roofing, other Asbestos Products, Insulating Materials.
Gas-Tight Composition Tank Roofs and Bottoms installed, and Wood Roofs Repaired.
American Pipe Line Equipment.

COMPLETE CONTRACT WORK
SPECIALIZING IN TANK ROOF WORK AND PIPE LINE PROTECTION
Specifications and prices upon request.

necessary to make a careful inspection of each joint, and in general the reconditioning work included straightening, cleaning, sand blasting, spot welding, air chipping, beveling, electric welding into 40-ft. joints, priming by spray gun and coating and wrapping with machine. This work was started May 1, and was completed July 1 with an average of 4,000 ft. of pipe being completed daily. It is estimated that only 10 per cent of this pipe was lost in the reconditioning process and a large percentage of the loss could be salvaged for other purposes or sold for scrap.

As the pipe was received in 20-ft. lengths, racks were laid parallel to facilitate welding into 40-ft. joints. After beveling off the old acetylene welds, the pipe was electric-welded into 40-ft. joints and was then rolled on dollies and moved through a cleaning machine equipped with scraper knives. After passing through this machine, the pipe was culled. Sections which were more corroded and required more work than others were rolled onto a separate rack so that the best sections could be moved ahead through the yard without delay.

From the cleaning machine, the pipe was rolled to the sand-blasting rack, after which it was chipped with air hammers to locate any spots or holes which may have been overlooked at the sand-blasting machine. The pipe was then spot-welded by a crew of three welders. The pipe was then moved to the primer rack where it was given one coat of cold-tar base primer which was applied with a spray gun.

### Coating Specifications

Coating specifications included two coats of cold-tar enamel, one wrapping of 15-lb. asbestos felt bonded and one wrapping with 60-lb. kraft paper. The coating was applied by the coating-and-wrapping machine in a single operation.

After the pipe was coated and wrapped, it was rolled to a padded rack for storage where it was loaded onto stringing trucks by a tractor equipped with a special gin pole and hauled to the right-of-way.

Every precaution was taken to protect the coating of the pipe while en route to the stringing gang. Trucks were equipped with padded-rubber bolsters while the tie-down chain for the pipe was also padded. Pipe was unloaded from the trucks with a specially built gin pole onto padded skids at the ditch and damage to the pipe was negligible. However, a holiday detector was run over the pipe prior to lowering in the ditch to assure a perfectly coated line.

The economic value of reconditioning programs has been recognized by the pipe-line industry for some time and it can be seen by this project that this company has been able to increase its facilities without the use of critical war materials. This reflects the growing importance of salvaging and reconditioning work under wartime conditions and this phase of operation is expected to be expanded in the Gulf Coast area during the next several months.

●

## Welding Meet Will Feature 60 Educational Papers

Education of industry in the many new advances in welding, which already have greatly speeded war production, will be the keynote of the American Welding Society's annual convention in Cleveland, Ohio, the week of October 12. The importance of training operators to meet the growing demand for welded construction will be stressed. At the opening session the entire convention will be turned over to a discussion of that subject.

The meeting of the society will be held in conjunction with the National Metal Congress and the National Metal Exposition. Each of the papers will have an important bearing on some phase of war production.

# The *OXIDATION* of Aliphatic Hydrocarbons (Part 1)

By GUSTAV EGLOFF, D. V. NORDMAN, and P. M. VAN ARSDELL
Universal Oil Products Co., Chicago, Ill.

*EDITOR'S NOTE: This is the first part of a section in a series devoted to the most important chemical reactions of aliphatic hydrocarbons. The first section discussed the halogenation of the hydrocarbons and this section will discuss their oxidation. This will be followed by a section discussing their nitration. The first part of this series appeared August 20 and subsequent issues have carried one part to date. The contents of this section is outlined as follows:*

OUTLINE

1. Introduction.
2. Oxidation of alkanes.
   A. Thermal oxidation of alkanes.
   B. Catalytic oxidation of alkanes.
   C. Use of oxidants other than oxygen gas.
3. Oxidation of alkenes.
   A. Thermal oxidation of alkenes.
   B. Catalytic oxidation of alkenes.
   C. Use of oxidants other than oxygen gas.
4. Oxidation of alkynes.
5. Conclusion.

## 1. Introduction

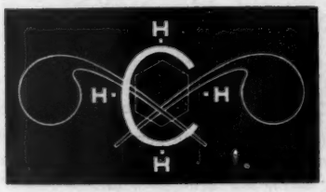
OXIDATION of hydrocarbons from natural gas, petroleum and coal is the basis of many industrial reactions. Oxidation plays one of the major roles in the oil industry, not alone from the detrimental viewpoint of corrosion, gum formation in gasoline, and lubricants, but also from the highly useful side of combustion of fuels for heating; operating machines of many types—automotive, diesel, stationary engines, etc., and oxidized derivatives of petroleum useful in many arts.

Control of air oxidation is most important from an industrial standpoint in order to obtain greatest efficiencies. There are a number of other type oxidation reactions which produce highly useful derivatives. One of the important oxidation reactions in all industry is that of producing heat, and many hydrocarbons are used for this purpose in the form of natural gas, petroleum and coal products. The ultimate products of the oxidation or combustion of hydrcarbons are carbon dioxide and water.

For a number of years the use of petroleum gases in various industries has been notable. Combustion figures large in this industry as is shown in Table 1 where the gases used for industrial fuels, gas manufacturing, and domestic use are the largest amounts marketed in all cases except pentane where the chemical manufacture from pentane gases takes the largest consumption figure.

In many catalytic reactions such as cracking and hydroforming of oil, dehydrogenation of butane to butylene and butadiene, ethyl benzene to styrene, polymerization, etc., the catalyst is regenerated with air in closely controlled amounts. This close control of oxidation of the hydrocarbonaceous material on the catalyst is necessary to prevent the destruction or modification of its activity due to improper temperature control. There is a process in commercial operation in which oxidation of naphthas to butadiene and other useful products takes place. This is called the "quickie butadiene" method in the synthetic rubber program.

Oxidation has furnished such widely diversified products as acids, fatty acids, aldehydes, and alcohols from the gases, intermediate fractions, and waxes of petroleum, naphthenates for manufacture of varnish carriers from lower boiling fractions, lubricating oil addition compounds and air-blown asphalts. Germany has been producing soaps and edible fats from fatty acids derived



from oxidation of petroleum waxes. The higher acids are reacted with caustic soda yielding soap. To produce edible fats glycerin and acids react forming fats.

In the case of hydrocarbon oxidation, the spread in value between the hydrocarbon raw material and the possible products is generally so large that relatively small yields may be economically exploited.[1] Formaldehyde, acetaldehyde and methanol are produced commercially from natural gas. Peroxides, alcohols, aldehydes, ketones, fatty acid and varnish formations due to oxidation reactions formed in cracked gasoline are difficult to refine, but their formation is checked and prevented by the use of antioxidants. Oxidation of lubricating oils and greases leads to their deterioration and is controlled by using additives. Also, the formation of varnishes on valve stems in an engine cuts down the efficiency of utilization causing sticking rather than proper lubrication. These latter oxidations have been checked by the use of preventives. An important oxidation reaction of methane and steam produces hydrogen which is used commercially in the synthesis of ammonia with nitrogen and in coal and oil hydrogenation to produce gasoline and other products.

In Russia the oxidation of oil distillates, paraffin waxes and vaseline was the problem of many researches after World War I, due to the scarcity of fatty acids for soap making. Five aldehydes, caproic, heptoic, caprylic, nonylic, and capric, and six alcohols, from hexyl to dodecyl, were isolated from the first oxidation reaction. The amount of aldehydes obtained in the first reaction amounted to about 7.7 per cent, and the alcohols to 12.3 per cent. The alcohols were oxidized further to yield the acids and it was shown that normal acids were former having from 6 to 12 carbon atoms. The alcohols and aldehydes before further treatment were found to be of value in the perfumery industry, and the heptyl and octyl alcohols were shown to be good stabilizers in alcohol-gasoline mixtures, while the alcohol-aldehyde fraction is inexpensive enough to form the basis of an industry for synthetic carboxylic acids.[1a]

[1] Marek and Hahn, pp. 12-13 (1932) Chemical Catalog Co., New York.

TABLE 1—MARKETED PRODUCTION OF LIQUEFIED PETROLEUM GASES*

| | By uses 1941 (1,000 gal.) | | | |
|---|---|---|---|---|
| | Butane | Propane | Mixtures butane-propene | Pentane |
| Domestic | 33,873 | 98,048 | 87,673 | 1,128 |
| Gas manufacturing | 12,152 | 6,678 | 6,368 | 57 |
| Industrial fuel | 46,677 | 16,730 | 35,287 | 34 |
| Chemical manufac. | 289 | 1,528 | 39,243 | 3,146 |
| Internal combustion engine fuel | 18,799 | 1,631 | 46,411 | .... |
| All other uses | 454 | 2,354 | 4,240 | 22 |
| Total | 112,244 | 126,969 | 219,252 | 4,387 |

*U. S. Bureau of Mines, preliminary data for 1941.

### Types of Hydrocarbons

The present study is confined to oxidation reactions involving alkanes, alkenes, alkynes, i.e., paraffins, olefins and acetylenes.

Oxidation of aliphatic hydrocarbons has been widely studied to establish an adequate reaction mechanism. Different initial steps are postulated for the mechanism of reaction in the hydroxylation and peroxidation theories, but the courses of reaction are similar in other respects. A theory involving aldehyde degradation and one involving activated molecules have also been advanced. Chain propagation of the reaction is agreed upon in all the theories.

Oxidation reactions of aliphatic hydrocarbons are characterized by induction periods and are sensitized by the addition of intermediate oxidation products. An excess of oxygen has an inhibitory effect on the oxidation of both saturated and unsaturated aliphatics. Alkane oxidations occur at lower temperatures than are necessary for alkene-oxygen reactions. Hydrocarbon-oxygen reaction rates are increased by increasing the pressure, although alkanes are more affected by pressure changes than are alkenes. Normal alkanes are more readily oxidized than the branched isomers, and lengthening the normal chain facilitates oxidation. Unsaturated aliphatics are more resistant to oxidation than the corresponding alkanes.

Oxidation reactions in the presence of catalysts reach a state of equilibrium so rapidly that the isolation of intermediate products is difficult or

[1a] Nametkin and Zvorykina, J. Gen. Chem. U.S.S.R. 4, 906-14 (1934) from Universal Oil Products Co. Survey of Foreign Petroleum Literature, Trans. S-213, Aug. 21, 1942.

impossible. Both saturated and unsaturated aliphatics have been oxidized in the presence of nitrogen oxides, metals, and metallic oxides. Alkene and alkyne hydrations have been carried out with acids, salts and metallic oxide catalysts.

Partial oxidations of aliphatics have been carried out with such compounds as ozone, metallic oxides, acids, and hydrogen peroxide.

### 2. Oxidation of Alkanes

Thermal and catalytic oxidation of the alkanes, especially methane, has been studied extensively. The early theories of preferential oxidation of carbon or hydrogen have given place to more complex theories. Increasing complexity of the reaction as the hydrocarbon chain lengthens makes direct analytical substantiation of these theories very difficult. Chain propagation of the reactions is highly probable, although the method of chain initiation is uncertain. Theories advanced for various hydrocarbons differ in some points, and it is possible that the different alkanes may be isolated problems.[3]

Experimental conditions and their effects have been studied with the object of obtaining high yields of intermediates from thermal oxidation of alkanes. Catalysts are used in an effort to obtain commercially profitable yields of partial oxidation products. Oxidations of alkanes, however, are similar stepwise reactions in which each step proceeds with less difficulty than the preceding one. For this reason, it appears that a catalyst promoting the initial reaction would likewise accelerate each succeeding one.[3]

#### Oxides of Metals

Oxides of certain metals may be used as alkane oxidants. These reactions are catalyzed by small amounts of other metallic oxides which in themselves are poor oxidizing agents. Ozone seems to act both as an oxidant and as a catalyst when added to alkane reacting mixtures.

There have been a number of theories proposed for the mechanism of oxidation reactions of which four are given in detail; the hydroxylation, peroxidation, aldehyde degradation, and preliminary dehydrogenation. Of these four the peroxidation and hydroxylation theories are the most widely accepted today although there has been considerable disagreement among various authorities as to which theory is most nearly an explanation of the true reaction mechanism. Whatever the explanation of the formation, the reaction is extremely rapid and any compound would be instantly broken down under the conditions of the reaction.

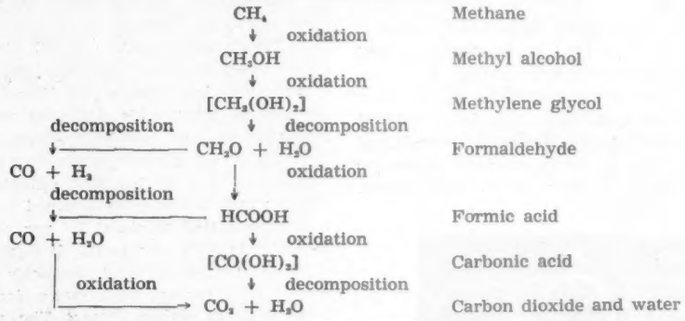
The equations showing the course of the peroxidation mechanism are given. A per-acid which is the product said to be formed during methane oxidations decomposes at the walls of the reaction chamber giving rise to monovalent radicals which carry on the reaction.[4]

**PEROXIDATION MECHANISM**

$$HCO(OOH) \rightarrow HCOO + OH$$
$$OH + CH_4 \rightarrow H_2O + CH_3$$
$$CH_3 + O_2 \rightarrow HCHO + OH \text{ formaldehyde}$$
$$OH + HCHO \rightarrow H_2O + HCO$$
$$HCO + O_2 \rightarrow HO_2 + CO$$
$$HO_2 + HCHO \rightarrow H_2O + CO + OH$$
$$OH + \text{wall} \rightarrow \text{Deactivation}$$

Instead of the per-acid formation and its propagation by means of the hydroxyl radical, the hydroxylation theory shows the primary formation of an alcohol as the first step in the mechanism of reaction. This theory accounts for many of the compounds formed upon oxidation. The following equations show the mechanism of reaction for the hydroxylation theory.

**HYDROXYLATION MECHANISM[5]**




(Compounds that have not been isolated are enclosed in brackets)

The primary dehydrogenation theory explains the formation of olefins and other unsaturates during oxidation reactions, and is essentially a cracking reaction wherein only the hydrogen is eliminated from the molecule. The theoretical path of the reaction is as follows:

1. Preliminary dehydrogenation to free radicals.
2. Formation of higher hydrocarbons from free radicals.
3. Mechanism involving either hydroxylation or peroxidation of higher hydrocarbon.

Aldehyde degradation mechanism is more appropriate for the longer straight chain hydrocarbons since its nature is such that at lower reaction temperatures an aldehyde and steam are formed as follows:

**ALDEHYDE DEGRADATION MECHANISM**

$$CH_3CH_2CH_3 \rightarrow CH_3CH_2CH_2OH \rightarrow$$
$$CH_3CH_2CH(OH)_2 \rightarrow CH_3CH_2CHO + H_2O \rightarrow$$
$$CO + H_2O + CH_3{\cdot}CH_3 \rightarrow CH_3{\cdot}CH_3 \rightarrow$$
$$CH_3CH_2OH \rightarrow CH_3CH(OH)_2 \rightarrow CH_3CHO + H_2O \rightarrow$$
$$CO + H_2O + CH_4$$

As is shown this process repeats itself in the case of any hydrocarbon until the final degradation products are carbon monoxide, water and methane.

#### A. Thermal Oxidation of Alkanes

A number of general rules applying to oxidation have been formulated dealing with the structures and their relation to ease of oxidation.

1. The longer the straight chain of carbon atoms contained in organic molecules, the less difficulty is encountered in their oxidation.
2. Branching in the molecule increases the difficulty of oxidation.
3. The thermal stability of pure normal paraffins is inversely proportional to chain length.
4. The initial combustion temperature is lowered as the carbon content of the normal paraffin increases.

Temperatures between 0° and 700° have been used in thermal reactions, but most of the work has been carried out in the range between 200° and 500°. Pressures up to 350 atm. have been used, although pressures only slightly above atmospheric are more generally used.

An increase of temperature results in a shorter induction period and a more rapid rate of oxidation.[6,7] Elevation of temperature, below that at which cracking is ordinarily carried out, causes rupture of molecules.[8] Shortening the induction period of methane by use of higher reaction temperature does not alter the formaldehyde concentration at the end of the induction period.[9]

Propane oxidation at 274°, 460 mm. and at 400°, 360 mm. yielded peroxides and aldehydes in larger quantities than when the reaction was carried out at the higher temperature.[10] The aldehydes seemed to be oxidized to aldehyde-peroxides, per-acids, or both. These complex compounds decomposed into simpler molecules which ultimately formed formaldehyde. At the higher temperature, a greater percentage of the unsaturated hydrocarbons was found. Butane yielded products comparable to those from propane, but the reaction rate was greater than with propane.[11] Pentane oxidation was accelerated by temperature increase up to 280°, beyond which the temperature coefficient become negative.[12] Oxidation of pentane occurred at a lower temperature when the reaction mixture was heated slowly than when heated rapidly.[13] Slow heating, presumably, permits the early formation of products which initiate the reaction. Preheating the reactants before combining them does not shorten the induction period.[9]

The composition of the reacting mixture influences both rate of oxidation and the amount of oxidation products formed.[14,15,16] The most reactive methane mixture is a 2 : 1 molecular ratio of hydrocarbon to oxygen.[17,18] If oxygen is slightly in excess, variation in its concentration has little effect on the oxidation,[19] but the presence of a great excess has an inhibitory effect. Although the induction periods of ethane[17] and propane[20] were longer when the oxygen concentration was high, the reaction rate was greater after the reaction began. Since rapid reaction causes a temperature rise which is destructive to liquid products already formed, high hydrocarbon concentrations favor increased yields of partially oxidized products.[21,22]

Pressure increase influences hydrocarbon oxidation in several ways:[23] (*a*) increases frequency of molecular collisions with subsequent increase in reaction rate, (*b*) deactivates chain carriers. (*c*) alters electrostatic field, giving rise to induced or increased polarity, and (*d*) directs a reaction so that less space is required. The volume changes involved in methane oxidation indicate that pressure may have a directing influence on the course of the reaction:[24]

(*a*) $2CH_4 + O_2 \rightarrow 2CH_3OH$
(*b*) $2CH_3OH + O_2 \rightarrow 2HCHO + 2H_2O$
(*c*) $2HCHO + O_2 \rightarrow 2HCOOH$

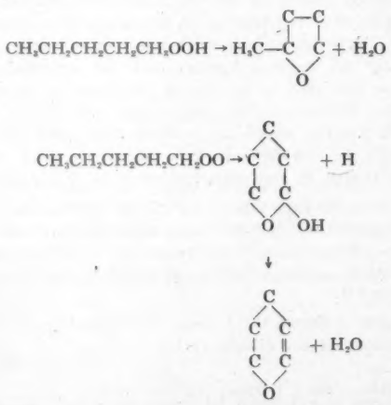
[3]Beatty, Chem. Reviews 21, 328 (1937).
[3]Marek and Hahn, p. 163, "The Catalytic Oxidation of Organic Compounds in the Vapor Phase," Chemical Catalog Co., New York, 1932.
[4]Von Elbe and Lewis, J. Am. Chem. Soc. 59, 976 (1937).
[5]Egioff, G., and Schaad, R. E., Chem. Rev. 6, No. 1 (1929).
[6]Arditti, Compt. rend. 201, 396 (1935).
[7]Wheeler and Blair, J. Soc. Chem. Ind. 42, 491T (1923).
[8]Burwell, Ind. Eng. Chem. 26, 204 (1934).
[9]Bone and Gardner, Pro. Roy. Soc. 154A, 297 (1936).
[10]Newitt and Thornes, J. Chem. Soc. 1937, 1656.
[11]Pease, J. Am. Chem. Soc. 51, 1839 (1929).
[12]Prettre, Ann. combustibles liquides 12, 411 (1937).
[13]Pidgeon and Egerton, J. Chem. Soc. 1932, 661.
[14]Prettre, Compt. rend. 202, 1176 (1936).
[15]Prettre, Compt. rend. 202, 954 (1936).
[16]Bone and Hill, Proc. Roy. Soc. 129A, 434 (1930).
[17]Bone, J. Chem. Soc. 1933, 1599.
[18]Bone and Allum, Proc. Roy. Soc. 134A, 578 (1932).
[19]Fort and Hinshelwood, Proc. Roy. Soc. 129A, 284 (1930).
[20]Pease, Chem. Reviews 21, 279 (1937).
[21]Newitt and Haffner, Proc. Roy. Soc. 134A, 591 (1932).
[22]Newitt and Bloch, Proc. Roy. Soc. 140A, 426 (1933).
[23]Newitt, Chem. Reviews 21, 299 (1937).

Pressure increase has a greater effect in lowering the reaction temperature of ethane and higher alkanes than of methane.[24] At higher pressures a larger percentage of alcohols, aldehydes, and acids forms.[23] Ethane oxidized at 260° to 280° and 100 atm. gave a predominance of products with the carbon atom content the same as that of the original hydrocarbon. As the pressure was increased to 100 atm., propane[25] and butane[25] gave higher yields of alcohols and ketones formed at nonterminal carbons.

### Foreign Gases

Alkane oxidations may be sensitized or inhibited by foreign gases and solids and by the addition of intermediate reaction products. Iodine,[26] bromine,[26] and tetraethyl lead[27] have an inhibitory effect on alkane reaction. The induction period of methane was shortened by the addition of such reaction products as methyl alcohol, ethyl alcohol, formaldehyde, acetaldehyde, and water vapor.[9,28] Formic acid shortened the induction period and increased the rate of the main reaction;[15] argon, nitrogen, and helium retarded oxidation,[28] while carbon mono- and dioxide had very little influence.[29] Increased reaction rate and lower reaction temperature of methane reaction mixtures after addition of inert gases have been reported.[30,31] The accelerating effect of the diluents may be due to prevention of chain breaking at the walls. The addition of a hydrocarbon halide in some cases prevents and in others promotes explosive reactions.[32,33] The retarding effect may be due to chain breaking by collision of chain carriers with inert molecules.[34] The presence of higher aldehydes[30] shortened the induction of ethane, but nitrogen addition caused no appreciable change in the main body of the oxidation.[35] Methane, oxygen, nitrogen, and hydrogen have been used as diluents in propane oxidation.[11] Nitrogen added to pentane at low temperatures and pressures shortened the induction period; the opposite effect was observed at high temperatures and pressure.[36] Argon, hexane, and valer-aldehyde shortened pentane induction, while pentene and isopentylalcohol had no effect.[12,37] Acceleration of alkane oxidation by addition of alkenes and alkadienes has been reported,[37] although this effect could not be shown by Pidgeon and Egerton with pentane.[38]

Spectrographic study of the alkane oxidation products showed a band similar to that found for oxygen ring compounds.[39] The band first occurred with butane oxidation and was found for the higher normal alkanes and isopentane. These ring compounds appeared to be either saturated or unsaturated and may be formed from intermediate compounds or radicals as shown for pentane:



Peroxides may be formed by further addition of oxygen to the ring compounds.

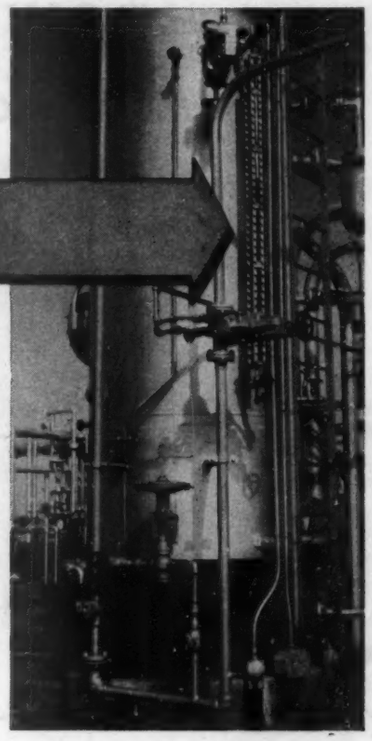
Increased size of the alkane molecule results in increasing complexity of the oxidation compounds. Besides products with carbon atom content, the same as that of the initial alkane, compounds result from dehydrogenation and decomposition with oxidation of new molecules formed. The principal products from methane oxidation at normal pressure are formaldehyde, formic acid, carbon monoxide, and dioxide, and water,[9] while propane yields alkenes, alkynes, lower alkanes, aldehydes, acids, per-acids, carbon monoxide and dioxide, and water.[10]

An induction period is noted for all the alkenes,[15,39] and may be shortened but not eliminated by addition of third substances such as aldehydes or by an increase in temperature. During the induction period, active centers are formed, and the reaction chains are initiated from these centers.[9] Whether chains are initiated or broken on the walls of the reaction vessel is uncertain although the lengthening of the induction period[39,29] and lowering of reaction rate[39,40] caused by increasing the ratio of surface to volume point to chain breaking on the walls. Monovalent radicals may be formed at the walls,[41] and the reaction is

[23]Townend, Chem. Reviews 21, 259 (1937).
[24]Newitt and Schmidt, J. Chem. Soc. 1937, 1665.
[25]Coward, J. Chem. Soc. 1934, 1382.
[26]Pidgeon and Egerton, J. Chem. Soc. 1932, 676.
[27]Van Heiningen, Rec. trav. chim. 55, 65 (1936).
[28]Norrish and Foord, Proc. Roy. Soc. 157A, 503 (1936).
[29]Prettre, Compt. rend. 203, 1152 (1936).
[30]Thompson and Kearton, J. Chem. Soc. 1932, 933.
[31]Jorissen, Booy and Van Heiningen, Rev. trav. chim. 51, 868 (1932).
[32]Jorissen and Hermans, Rec. trav. chim. 52, 271 (1933).
[33]Jorissen, Coll. Czechoslov. Chem. Commun. 2, 288 (1930).
[34]Steacie and Plewes, Proc. Roy. Soc. 146A, 583 (1934).
[35]Prettre, Compt. rend. 203, 561 (1936).
[36]Lewis, J. Chem. Soc., 1929, 759.
[37]Ubbelohde, Proc. Roy. Soc. 152A, 354, 378 (1935).
[38]Brunner, Helv. Chim. Acta 13, 197 (1930).
[39]Pease and Munro, J. Am. Chem. Soc. 56, 2034 (1934).
[40]Lewis and Von Elbe, p. 89, "Combustion, Flames, and Explosions of Gases," Cambridge University Press (1938).


JERGUSON

Reflex Gages



A GAGE to be useful must be readable at a glance—at a distance. It must also be so well constructed that it will stay in service under extreme conditions of temperature, pressure, or corrosion.

All requirements are to be found fully in Jerguson Gages. Standard Reflex Gages are designed for pressures up to 3200 pounds at 100°F. or for 1200 pounds at 1000°F. Special gages for higher pressures.

• • • •

The Transparent Gages are for the less severe services or where the condition of the liquid as well as its level must be noted. They are made for pressures up to 2000 pounds at 100°F., or for pressures up to 600 pounds at 1000°F.

STURDY CONSTRUCTION

★

HIGH VISIBILITY

JERGUSON GAGE & VALVE CO.

85 Fellsway Somerville, Mass.

8-JV-2

**TABLE 2—THERMAL OXIDATION OF PARAFFIN HYDROCARBONS**

| Hydrocarbon— | Reaction conditions: Temperature | Reaction conditions: Pressure | Reaction products |
|---|---|---|---|
| Methane | | 760 mm. | Formaldehyde, formic acid, CO, $CO_2$, and water |
| Methane with steam | 1,000° for completion and 1,300° for quantitative reaction | | Carbon monoxide and free hydrogen |
| Ethane | 260°-280° | 100 atm. | Alcohols, aldehydes, and acids |
| Propane | | | Aldehydes, acids, per-acids, CO, $CO_2$, *alkenes, alkynes, lower alkanes |
| | 274° | 460 mm. | Peroxides and aldehydes |
| | 400° | 360 mm. | Peroxides and aldehydes |
| | | 100 atm. | High yields of alcohols and ketones |
| Butane | Greater reaction rate than propane (spectrographic study) | | Comparable reaction products to propane. Furane rings, peroxides |

*Hydrocarbons also formed.


MORE **POWER** TO UNCLE SAM
CAN MEAN MORE POWER TO YOU!

CISCO SOLVENT "KEEPS 'EM ROLLING" . . . AND IN SERVICE

Cisco Solvent is in the Army now. Yes, sir, this remarkable Cities Service petroleum product which cleans engines internally and restores power to tired motors, has gone to work for Uncle Sam.

It happened just a few weeks ago. A small quantity of Cisco Solvent was ordered by the Army for experimental use on the trucks and transport vehicles of an Army camp in the South. Matched with a competitive product, Cisco Solvent was put through every conceivable test—*and came out with flying colors!* Since then, Cities Service has sent more than 12,000 gallons of Cisco Solvent to this camp alone.

Why not profit by Uncle Sam's experience? Whether you operate heavy trucks, light trucks or company cars find out what this famous internal engine cleaner can do for you. You'll be amazed how it removes harmful gum, sludge and varnish from the engine, the transmission and the differential, and prolongs the life of all moving parts. Call the nearest Cities Service office for a Cisco Solvent demonstration right in your own office.

CITIES SERVICE OILS — ONCE-ALWAYS

CITIES SERVICE OIL COMPANIES
NEW YORK • CHICAGO • SHREVEPORT

OIL IS AMMUNITION — USE IT WISELY!


slower when the reactor is coated with material destroying, or preventing radical formation. Quoting the experimenters: "Chains may be broken by diffusion of radicals to the walls or by their recombination in the gas phase. The kinetic evidence . . . favors the former as the main chain breaking process."

### Alcohol Formations

It has been shown experimentally that formaldehyde and hydrogen react under high pressures to form methyl alcohol.[42] The reaction would account for alcohol formation through a secondary reaction rather than the primary postulated by the hydroxylation mechanism.

The initial oxidation product in aldehyde degradation is an aldehyde with the same number of carbon atoms as the original alkane. The aldehyde is further oxidized with the loss of one carbon atom. This process is repeated until products are formed which are resistant to further oxidation or a temperature is reached at which general decomposition of the molecule takes place. The point of initial oxidation is on the carbon at the end of the longest unbranched chain.[7, 43] In the case of branched molecules, the reaction rate decreases when the branch is reached. The slower reaction rate results from the formation at the branch of a ketone, which is more resistant to oxidation than an aldehyde. Some experimental evidence indicates deviation from the course of reaction postulated by the aldehyde theory. Although the oxygen consumed in the oxidation of 2,5-dimethylhexane was that predicted by the aldehyde theory, the ketone, 5-methyl hexane-2-one, was not formed.[3] In oxidations of *n*-octane, nonane, and decane, ketones formed by reaction on the second carbon atom were reported.[44] With *n*-pentacosane, oxygen reacted first at the second carbon atom, then the third, fourth, and so on to the center of the molecule.[8] Oxidation began at the fourth carbon in *n*-triacontane, and scission of the molecule occurred at this point upon further oxidation.[45] Methyltriacontane yielded a high percentage of aldehydes with different carbon atom content and a percentage of acetone low for a branched chain.[46] These facts indicate the rupture of the methyltriacontane molecule at several points.

### High Molecular Weights

Oxidation of the higher molecular weight aliphatic petroleum fractions[47] and solid waxes have been of considerable importance from an industrial standpoint, particularly in the manufacture of lubricants, soaps, and edible fats. As lubricant additives, the higher acids have the properties of depressing the pour point and increasing the lubricating quality of the oil. Aside from the use as an additive[48] for lubricants, the soaps from these acids have found extensive use in the textile industry as wetting agents, and the ammonium soaps are used as agents in the breaking of oil-water imulsions. The higher alcohols above $C_8$ from paraffin waxes are used as foam preventing agents in the fermentation industries, and are also useful in the preparation of yeast cultures.

The different theories for alkane oxidation, i.e., hydroxylation, peroxidation, activation of molecules, formation of free radicals, and aldehyde degradation, support chain propagation of the reaction.[29, 35]

Table 2 shows the resume of thermal oxidation reactions of the alkane series.

[42]Milas, Chem. Reviews, 10, 343 (1932).
[43]Pope, Dykstra, and Edgar, J. Am. Chem. Soc. 51, 1875, 2203 (1929).
[44]Chavanne and Tock, Bull. soc. chim. Belg. 41, 630 (1932).
[45]Francis and Wood, J. Chem. Soc. 1927, 1897.
[46]Landa and Pokorny, Coll. Czechoslov. Chem. Commun. 4, 456 (1932).
[47]A. W. Burwell, "Industrial Oxidation of Petroleum Hydrocarbons," the Science of Petroleum, Vol. 2, p. 1028, Oxford University Press.
[48]C. Ellis, The Chemistry of Petroleum Derivatives, Vol. 2, p. 978, Reinhold Pub. Co., New York (1937).

# GLOSSARY of terms used in PETROLEUM CHEMISTRY

## Isobutane

A colorless, stable liquid or gas, depending upon the temperature and pressure under which it is kept. Boils at 7.8° F., density 0.582 as liquid at 32° F. Closely associated with normal butane in natural gasoline. Separated by fractionation. Used in chemical synthesis and now most prominently as charging stock to alkylation units along with isobutylene to make isooctane. The isooctane is then blended with other hydrocarbon fractions and tetraethyl lead to make 100-octane aviation gasoline.

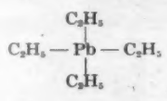
## Isooctane

A colorless liquid which boils at 240.8° F. Because of its availability it was picked as one of two extremes in a scale of values by which the

knocking tendency of a gasoline motor can be expressed. Isooctane suppresses knocking very effectively and was assigned an arbitrary value of 100. Another hydrocarbon of poor knocking qualities was given zero value. Between these extremes the tendency of the gasoline to knock is expressed as an "octane number" which means that the gasoline knocks as badly as that percentage of isooctane blended with zero-value material.

## Lead tetraethyl

Most refiners refer to this material as "lead." It is recognized as the most effective, practical knock suppressant available for blending with gasoline to be used as fuel in internal-combustion engines. Its chemical formula is



The commercially pure liquid is colorless and has an oily consistency. It has a pleasant odor. It is classed as a poison and is absorbed by the human skin. It mixes readily with gasoline and most organic liquids but remains insoluble in water.

## Mercaptan

Usually referred to in treating petroleum distillates for the removal of sulfur-bearing hydrocarbons. A mercaptan is any one of a series of such compounds having the general formula R-SH in which *R* is the hydrocarbon radical; *H* is a hydrogen atom, and *S* represents sulfur. The mercaptan is visualized chemically as having a structure similar to that of an alcohol or phenol in which sulfur is present in the place of oxygen.

## Nitration

A chemical process in which an $NO_2$ group replaces a hydrogen atom in an organic molecule. It is usually accomplished by the agency of nitric and sulfuric acids. In petroleum chemistry the word takes on unusual and timely importance because of the expanding usefulness of nitroparaffins in war and civilian work.

## Olefinic

Any straight-chain or aliphatic hydrocarbon containing a double bond between two carbon atoms in the chain. Chains containing two and three double bonds are known as diolefins and triolefins, respectively. The simplest olefin resulting from refinery cracking is ethylene or $CH_2 = CH_2$.

## Oxidation

The term, in its simplest sense, applies to any chemical change in which the percentage of oxygen in the molecule is increased, or the percentage of hydrogen decreased. Sometimes the term is used in a broader field to include chemical changes which do not involve oxygen or hydrogen but in which the valence of an element is altered.

## Paraffinic-naphthenic

Crude oils are often classified as paraffinic, asphaltic, or as mixed base. This designation is intended to show the volumetric predominance of one or the other types of hydrocarbons comprising the oil. Actually, all important sources of crude includes mixtures of straight-chain or aliphatic hydrocarbons and cyclic or naphthenic hydrocarbons. The straight-chain or aliphatic terms are synonomous with "paraffinic." The naphthenes are saturated ring compounds.

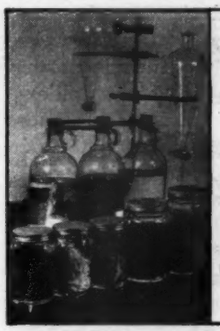
## Petroleum

This term is applied in the industry to a mixture of hydrocarbons contaminated to a small degree with combined sulfur, oxygen, or some other element. It includes natural gas and crude oil, as applied in the industry.

## Phenol

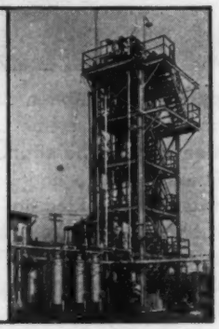
Although often mentioned in petroleum chemistry, it now is a product of the destructive distillation of wood or coal. In the pure state it is a white crystal having the structural formula:

In the commercial state it is slightly impure and takes on a pinkish appearance. Although the molecule includes an OH group, which in the case of paraffin or straight-chain hydrocarbons would make it an alcohol, the material described here is decidedly acidic.



# CHEMICALS *from* PETROLEUM

By W. T. ZIEGENHAIN



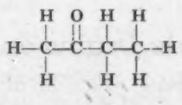
### METHYLETHYL KETONE

Refiners who early investigated chemical means for dewaxing lubricating-oil distillates or who desired to improve the viscosity-temperature characteristics of their motor oils by deasphaltizing the base stocks were continuously reminded of the selective solvent properties of methylethyl ketone.

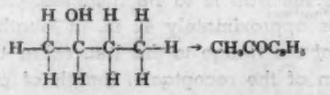
Its discussion here, however, is in regard to its properties and potential large-scale synthesis from petroleum.

Methylethyl ketone is a colorless liquid which boils at 175.2° F. and has a specific gravity of 0.808. Its production is generally by means of the controlled oxidation of secondary butyl alcohol which can be made by hydrolizing cracked refinery gases or by fermentation. Large quantities of methylethyl ketone have been made by oxidizing secondary butyl alcohol produced as a by-product of the fermentation of grains in the production of acetone

The structural formula for methylethyl ketone follows:



Here the two radicals, methyl ($CH_3$) and ethyl ($C_2H_5$) are clearly evident and the oxygen atom extending from the second carbon in the chain designates this as a ketone. Its synthesis from petroleum presumes the production of secondary butyl alcohol as an intermediate. As such, secondary butyl alcohol would be but a step in the controlled oxidation of both ketones and aldehydes. The theoretical procedure in the oxidation follows:



# Refinery IDEAS ... that save $ $ $

## Low-Pressure Steam Expansion Joint

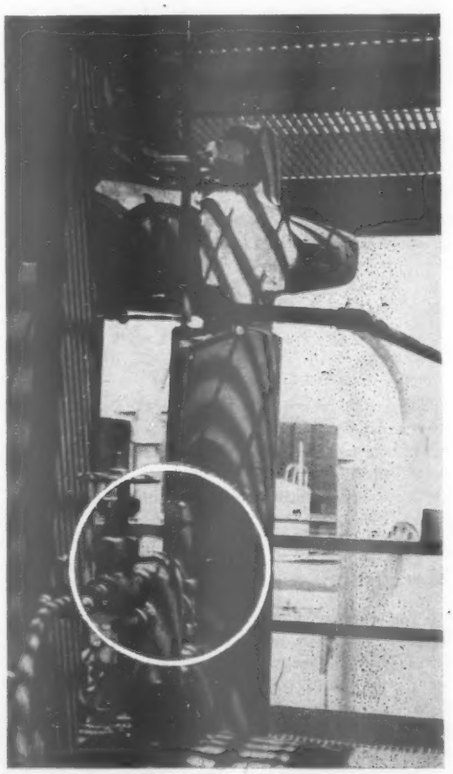
In constructing an exhaust-steam return system to a centrally located condenser and feed-water tank so that the exhaust steam might be reused in the boilers, the layout was such that it was felt necessary to include in the line some expansion joints. Since this exhaust line would be operated at less than 20 lb. per sq. in., it was not thought necessary to purchase expansion joints for this particular job if something else could be devised to give the reasonable protection. The exhaust-steam line was 8 in. in diameter so the main sleeve of the expansion joint was made of 10-in. pipe. The 10-in. pup-joint was cut 6 ft. long and swaged on one end so that it could be welded to the 8-in. exhaust-steam line. The other end was swaged down to fit the sleeve of an 8-in. Dresser coupling that had been cut in half. A section 18 in. long was cut out of the line in such a manner that the 10-in. sleeve could be slipped over the 8-in. line after the half-Dresser sleeve had been welded on one end. The base was then welded to the main line. A regular Dresser rubber-type gasket was used to make the joint tight and has shown the best of service, having been in continuous use for 2 years. The bolts used to draw the Dresser flange up against the gasket were made in the machine shop and have square heads. The square nuts, needed to engage to take bolt threads, were welded on the 10-in. sleeve where the swaging began.

## Condensate Drains on Steam Line

Some condensate exists in almost any refinery steam line, regardless of size or service and this tends to endanger equipment or at least reduce the operating efficiency of the system. One refiner has made it a practice to install water traps or legs in his steam mains at low points and at junctions to provide for condensate removal. The water leg is made by using only three items. A flange is used to connect the trap directly to the underside of the steam line. To this is welded a short length of pipe the same size as the main at the point where the trap is to be installed. On a 6-in. main the trap is approximately 42 in. in length over-all from the face of the flange to the 1-in. collar that is welded into bottom of the receptacle, length of pipe that has been welded onto flange having been swaged down to take a 1-in. collar. A nipple and gate valve is fitted to the 1-in. collar along with the necessary fittings to connect a strainer and an impulse-type steam trap hung overhead from the return condensate line. The strainer is fitted with a nipple and valve so that it can be blown down frequently enough that any sediment or trash collection will not become so great as to cause a stoppage of the flow of condensate to the steam trap. In the picture a double-valve arrangement is shown at the base of the condensate trap. The use of a double valve here was caused by the failure of the original valve and the impracticability of shutting the steam out of the main and bleeding down the pressure to make the change in valves. Both will be reconditioned as soon as conditions permit.

## Novel Methods Used to Keep Quench Line Open

Coking often proves to be a serious problem at the point in the cracking-coil equipment where the quenching oil is introduced into the stream. The restricted flow of quenching oil and the subsequent stoppage of quenching-oil flow leads to inefficient operation and short operating cycles. One refinery at which these troubles occurred devised a means to keep the flow open at all times and with a minimum of personal attention. The principal parts included a T-shaped connection which contained a packing gland at one end of one of the arms. Through this gland the operator inserted an ordinary, long, round-necked drill. The cutting edge remained in the upper part of the T while not in use, the stem of the drill extending through the gland. As the connection tended to coke up, the long drill stem was rotated and forced into the opening to clean it. The equipment used here consisted of a long screw, threaded through two supports mounted to allow the screw to set directly over the drill stem. A socket arrangement keeps the drill stem and screw engaged. When the drill is to be forced through the partially coked opening, the hand rotation of the screw provides ample power and after the hole is cleaned, the pressure of the cracking coil forces the drill upward and holds it tightly against the screw. The periodic downward forcing of the drill plus the rotation given by hand keeps constant the flow of oil.



# CO$T Engineering

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL



SEPTEMBER 24, 1942

# COST OF TREATING EMULSIONS

DISREGARDING the simple "settling out" process, in which the difference in gravities of oil and gas, acting through time, is the sole cause of breaking down the emulsion, methods of treating the emulsified oil can be divided into four main groups: thermal, chemical, electrical and mechanical. Combination of two or more of these methods generally is being used in actual field practice.

Treating methods have been well standardized, simplified and brought to a high degree of efficiency. Nevertheless, the treating cost may become an unnecessarily high portion of the operating expense of a lease unless continuous and close supervision is exercised over treating operations.

No fixed standard can be set which would denote what constitutes a satisfactory treating cost per barrel. Every well presents a different treating problem. In fact, every well presents different treating problems in different stages of its life. In general, however, the treating cost ranges from $0.001 to $0.030 per barrel although costs outside of these limits are not uncommon. It should be stated that fictitiously low treating costs per barrel often are obtained by disregarding or charging to other operations expenditures which are properly chargeable to treating of oil.

The treating cost per barrel is satisfactory for casual check of efficiency of treating operations. If, however, a sudden increase of treating cost cannot be explained by any of normal causes, such as seasonal changes of temperature, bringing in of a new well with production unusually difficult to treat, or others, then analysis of treating cost is necessary to determine which of the components is contributing to the increase of the total cost.

Assuming that treating operations on a given lease are a combination of all four of the above-mentioned treating methods (thermal, chemical, electrical and mechanical), then the total treating cost would consist of the following components: Labor, chemical, fuel, royalty, electricity and miscellaneous costs.

To obtain the over-all cost picture it is necessary to add to this figure the monthly depreciation charge against the treating plant. For the purpose of checking the efficiency of the treating operations, the operating treating cost should be used. The depreciation charge may vary from month to month due to additions to or changes in treating-plant facilities involving capital expenditures. This would tend to distort the picture, introducing a variable factor which is not a function of efficiency of treating operations.

Variation in treating cost depends on type of crude treated, type of treating facilities used, efficiency of operations, climatic conditions encountered and, to some degree, accounting methods used. For a given plant, disregarding the seasonal changes of temperature, an increase in treating cost per barrel can be traced either to changes in character of emulsion treated or to decrease in efficiency of treating operations.

Whenever a sudden increase in treating cost per barrel occurs it is well to investigate first the chemical treating cost. It is only natural that in case of treating difficulty there is a tendency on the part of the treating-plant operator to try to overcome this difficulty by increasing the amount of chemical used. Actually, in many cases, the proper cure would be not the increase in the amount of chemical but a change in formula.

A good method of checking the efficiency of chemical treatment is monthly calculation of the so-called chemical ratio; that is, the number of barrels of finished oil treated per barrel of chemical used. Once a satisfactory ratio is determined for a given set of conditions attempt should be made to maintain this ratio at a reasonable constant value.

The labor treating cost per barrel may vary from zero to as high as $0.010. In many cases the operation of a treating plant is practically automatic.

On the other hand, the labor treating cost may of necessity be quite high. Consider the case of a lease in a shallow Gulf Coast oil field having 16° A.P.I. gravity oil with considerable fresh water emulsion and fine suspended sand. The treating plant on this lease consists of settling tanks, chemical feeders, hot salt-water wash tanks, preheaters and electric dehydrators. Experience shows that the plant requires constant attention of the operator and all of his time has to be charged to the treating operations.

Fuel treating cost is another item which often is not properly charged against the treating operations. If gas for the operation of the treating plant is being purchased, or if fuel oil is being used, proper charges usually are made. In majority of the cases, however, gas produced by the lease is being used in the treating plant. The value of such a gas can be disregarded only in cases where the balance of the gas produced by the lease has no market and is not being credited to the lease as a revenue, or when the free return gas from the gasoline extraction plant is being used. The fuel cost per barrel is usually low and depends on climatic conditions. In moderate climate this cost should not exceed $0.003 per barrel on the average.

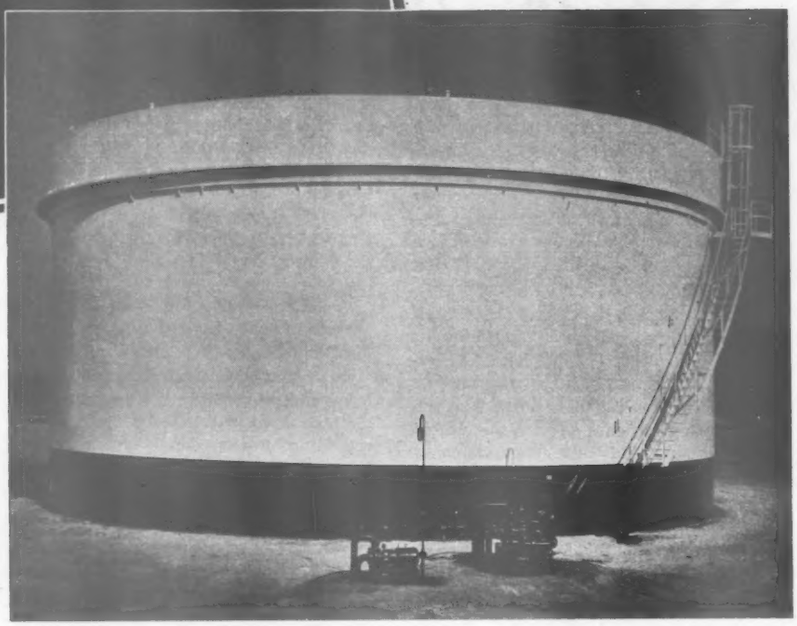
Whenever the electric dehydrator is being used the treating cost includes the royalty cost. This is a fixed charge per barrel and as such has no effect on fluctuations of the total treating cost.

A separate meter should measure all electricity used by the treating plant so that proper electrical treating cost can be obtained. The cost includes electricity used for lighting and for operation of electric motors and dehydrators, if used. The cost varies with type of installation and is usually too small to have any appreciable effect on the total treating cost.

Miscellaneous cost depends almost entirely on accounting methods used. The cost of additions to the treating plant involving capital expenditures becomes part of the treating cost through the monthly depreciation charge. Treating plant maintenance cost, however, involving replacement parts for pumps, motors, boilers, etc., may be charged either to a special treating account, in which case it becomes a part of the treating cost, or to general lease-maintenance accounts.

Any attempt to reduce the treating cost per barrel should be guided by the fact that all the costs of which the total cost is composed, are closely interrelated. Simple reduction of one of these costs may result in sharp increase of another so that the ultimate goal of reducing the total cost would be defeated.

# How to STOP STORAGE LOSSES at PIPE LINE TERMINALS



# GRAVER *Expansion Roof*

*The above photo shows a Graver Expansion Roof tank installed at a pipe line terminal of a major oil company.*

GRAVER Expansion Roofs are putting an end to storage losses at pipe line terminals of major oil companies in many sections of the country. They are providing efficient, economical storage of volatile products and contributing a definite part to the war effort by controlling breathing and evaporation losses—making possible extra savings in product and dollars.

When storage tanks are spaced reasonably close together they can be manifolded to a Graver Expansion Roof tank. Thus you get mass protection of an entire battery of tanks against vapor loss.

Conservation of gasoline is of vital importance today, and in the interests of Victory we urge you to investigate the Graver Expansion Roof as a possible solution to your own particular storage problems.

STEEL STORAGE TANKS
VAPOR CONSERVATION SYSTEMS
WELDED CONSTRUCTION
STRESS RELIEVING
X-RAYING
FABRICATED STEEL AND CORROSION-RESISTING PLATE
WATER SOFTENERS
FILTRATION SYSTEMS
CLARIFIERS
SEWAGE EQUIPMENT

GRAVER

GRAVER TANK & MFG. CO., INC.

NEW YORK
CATASAUQUA, PA.

4809-29 TOD AVE.
EAST CHICAGO, IND.
CABLE ADDRESS — GRATANK

CHICAGO
TULSA

42-24-S

# CO$T Engineering

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

RIG OPERATION

SEPTEMBER 24, 1942

# SELECTION OF MUD TREATMENT

THE natural inclination of operators and drilling contractors is to keep the cost of drilling fluids to a minimum although some consider the over-all problem and try to strike a balance between total rig-operating costs and the cost of mud materials. At times, however, the situation becomes so desperate that expensive treatment of the mud is a necessity.

When a well is about to blow out, when a hole is caving badly, or when there is danger of sticking the drill stem, expense is secondary to safety. A considerable expenditure for mud materials can be justified in an effort to prevent a blowout which would cause loss of equipment and the outlay necessary to bring the well under control. The same is true of a caving hole or one in which there is a tendency for the pipe to stick.

Normally, there are several courses open to the operator and drilling contractors when a drilling well is having hole trouble caused by an improperly constituted drilling fluid. Mainly these are: (1) Treat mud already in the system and bring it to desired characteristics; (2) replace old mud with a new one which the operator is certain will do the work. Which will be the cheaper course depends on the condition of the old mud and the difficulty of treating in comparison to the cost of entirely new mud.

The temptation is to keep the old mud and treat it to reduce water loss and filter cake and obtain the desired viscosity and specific gravity. This is due to the fact that the operator may have already spent a considerable sum of money for the mud in the system and considers it waste to throw it away. As it can no longer do the work required of it, and as it cannot be put in shape cheaply, it is often best to discard it and start anew. On the other hand, the operator and drilling contractor need not throw away the mud simply because it is giving some trouble as a simple and comparatively inexpensive treatment may make it usuable. Each individual case must be decided on its own merits.

Take the case of a well experiencing trouble from a high water loss mud due to contamination by salt water, cement and lime. The hole is caving badly and the drill pipe cannot be run to bottom. One of the principal causes of trouble is a rotten shale section which becomes incompetent due to wetting by water filtered from the drilling fluid. The remedy is to reduce the water loss. To complicate matters a gas sand encountered in drilling requires a certain specific gravity and a porous section which is anticipated at a greater depth may cause loss of circulation if the viscosity and weight are not maintained at the proper point.

The characteristics of the mud in the system which is giving trouble and the characteristics of the desired mud are given in Table 1.

Tests at the well show that to treat the original mud would require its dilution 25 per cent, the addition of 4 or 5 per cent by weight or inorganic colloidal material, chemicals amounting to 1:40 in the system, and the addition of approximately 7 lb. per barrel of mud of organic colloidal material. The mud system has a volume of 1,000 bbl. To dilute the mud it would be necessary to discard 250 bbl. and then add that amount of water.

Making new mud would require the mixing of 850 bbl. of water with inorganic colloids to obtain a 4 per cent by weight fluid, addition of the chemicals at a ratio of 1:40 plus 5 lb. per barrel organic colloidal material.

The time required for the two treatments is estimated to be about the same. However, it is known that the hole has a number of caves and the reclaimed mud would be subjected to contamination and would probably require additional treatment to maintain it. The mud produced could probably be controlled satisfactorily but there is a certain element of risk. Maintenance treatment of the new mud will be much less than the reclaimed drilling fluid. In addition, the new mud will be considerably safer as allowance has been made for contamination up to 25 per cent by the old mud present in the caving sections. At the same cost, the new mud would have advantages which would justify its selection. In the case in question it can also be shown (Table 2) that the use of a new mud results in a substantial saving.

It will be seen that the controlling factor in this case is the amount of the organic colloidal material required for the two treatments. The old mud needs 7 lb. per barrel to reach the desired characteristics while the new mud requires only 5 lb. per barrel. The new mud also requires less inorganic colloidal material to obtain the objective. A saving of $230 is obtained by starting anew.

Another point which should be remembered when making the choice of procedures is that almost invariably the old mud requires more treatment than originally estimated.

**TABLE 1**

| | Present mud characteristics | Desired characteristics |
|---|---|---|
| Water loss, 30 min at 100 lb. | 94 cc | 20 cc. or less |
| Filter cake thickness | 15/32 | 2/32 |
| pH | 11.3 | 11.0 or above |
| Salt | 5% by weight | As low as possible |
| Viscosity | 46 sec. | 38-40 sec. |
| Weight | 9.4 | 9.0 |

**TABLE 2—AMOUNT AND COST OF MUD MATERIALS FOR TWO DIFFERENT TREATMENTS**

| | | Treating old mud | | Making new mud | |
|---|---|---|---|---|---|
| Type material used: | Unit price | Amount | Cost | Amount | Cost |
| Organic colloids | $45.00 per ton | 8.1 | $405 | 7.0 | $315 |
| Water | 0.10 per bbl. | 250.0 | 25 | 850.0 | 85 |
| Chemicals | 0.275 per lb. | 800.0 | 220 | 800.0 | 220 |
| Organic colloids | 0.10 per lb. | 7,700.0 | 700 | 5,000.0 | 500 |
| Total | | | $1,350 | | $1,120 |

DEVOTED TO COST ESTIMATIONS, OPERATING CALCULATIONS AND PROFIT MAKING

# PARSONS

For extra wide trenches, not too deep, dual booms may be effectively used.

## For Speed in Digging Pipe Line Trenches

Trees, Poles, steep banks and other obstructions won't halt your pipe line digging when you are using a Parsons Trencher with the shiftable offset boom. Excavations may be made with boom in extreme right or left hand position, without sacrifice of speed or ease of operation. With a Parsons you can dig within 14 inches of a side obstruction, and on line with outside edge of either crawler. This one Parsons feature alone will save hours of digging time.

*For complete details write The Parsons Company, Newton, Iowa*

**TRENCHING EQUIPMENT**

# Engineering Fundamentals

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL No. 40

SEPTEMBER 24, 1942

# HEATING-VALUE DETERMINATION WITH CALORIMETER

THE determination of gas-heating value directly with a flow calorimeter probably gives more accurate final results that by calculation of the heating value from the analysis of the gas. This is true since the measurements taken with the calorimeter can be read with a finer degree of accuracy than measurements involved in the determination of gas analysis.

The flow calorimeter is essentially an accurately built hot-water heater. In this instrument the gas is burned after being carefully metered. A stream of water, flowing at a uniform rate, absorbs the heat. The apparatus is well insulated so that only a negligible portion of heat is lost by radiation. The gas and water enter at room temperature and the gases resulting from combustion leave at room temperature. So, from a practical standpoint, all of the heat produced by the combustion of a given quantity of gas will be absorbed by the circulating water, and can be calculated from the weight of water and its temperature rise.

The calorimeter test should be made in a well-lighted, well-ventilated, but draft-free room. Provisions should be made in the room to store about 25 gal. of water in a shallow overhead tank for 24 hours before the test so that the inlet water will be at room temperature when the test is made. In case the frequency of tests or other conditions will not permit fresh water to come to room temperature by standing in the tank, the proper proportions of hot and cold water may be mixed in the tank to obtain water at room temperature.

A steady, but sensitive, low-pressure gas regulator is necessary to insure a constant pressure on the meter and burner. A water-filled liquid-seal regulator is recommended for this purpose.

A wet-gas meter, accurately calibrated against a water bottle and with graduations to 1/1,000 cu. ft., is satisfactory for measuring the gas burned. The meter should be leveled by means of screws provided on the legs of the meter. The water level in the meter should be checked to see that it corresponds with the level indicated by a pointer in a gage glass on the side of the meter. When a meter is filled with fresh water, gas must be passed through the meter for about 1 hour to insure that the water has become saturated with gas.

**TABLE 1—BAROMETER CORRECTIONS**

| Temp., °F. | Observed barometric height, inches | | | |
|---|---|---|---|---|
| | 24.0 | 26.0 | 28.0 | 30.0 |
| 40 | 0.03 | 0.03 | 0.03 | 0.03 |
| 45 | .04 | .04 | .04 | .05 |
| 50 | .05 | .05 | .05 | .06 |
| 55 | .06 | .06 | .07 | .07 |
| 60 | .07 | .07 | .08 | .09 |
| 65 | .08 | .09 | .09 | .10 |
| 70 | .09 | .10 | .11 | .11 |
| 75 | .10 | .11 | .12 | .13 |
| 80 | .11 | .12 | .13 | .14 |
| 85 | .12 | .13 | .14 | .15 |
| 90 | .13 | .14 | .16 | .17 |
| 95 | .14 | .16 | .17 | .18 |
| 100 | .15 | .17 | .18 | .19 |

Values in the table represent amounts to be subtracted from the observed reading of a barometer with a brass scale to reduce observed reading to inches of mercury at 32° F.

The normal rate of combustion should be determined for any particular type of gas before proceeding with the actual heating-value test. The normal rate is defined as 70 per cent of the rate at which combustion begins to be incomplete. The rate at which combustion begins to be incomplete can be determined by using a burner orifice that will discharge approximately 3,000 B.t.u. per hour and gradually increasing the gas pressure on the burner with a constant flow of water through the calorimeter and noting the temperature rise of the outlet water. When a further increase in gas pressure (or in other words a further increase in combustion rate), does not cause a corresponding increase in outlet-water temperature, the maximum rate of combustion has been attained. Seventy per cent of the volume of gas burned per unit of time at this maximum rate represents the normal rate of combustion at which the calorimeter should be operated during the test for heating value. For any particular gas, it is not necessary to determine the normal rate of combustion each time a test is made. A check every few months is usually sufficient.

The air-supply ports of the burner should be adjusted to admit the proper amount of air. The proper amount of air is being used when the flame is blue with a slight yellow tip.

With the burner operating at the normal rate and with the proper adjustment on the air supply, the water flow should be adjusted so that the rise in water temperature will be about 15° F.

It is important that the gas connections between the meter and the burner be leakproof, so that the total amount of gas metered will actually be burned. To test for leaks, the gas at the burner should be shut off, leaving a valve open upstream from the meter. The system is now full of gas under pressure. The pressure should be read on a manometer attached to a connection on the meter or gas line between the open valve and the burner. The valve should then be closed. Any drop in pressure indicates a leak which must be remedied before proceeding with the test.

The data that must be taken as a part of the test are barometric pressure, room temperature, atmospheric humidity, temperature of products of combustion, gas pressure and temperature at the meter, temperature of inlet water, temperature of outlet water, gas volume reading on meter, weight of water that flowed through the calorimeter during the combustion of a given volume of gas, measurement of water condensed from the combustion products.

The relative humidity of the air in the room can be determined using a sling psychrometer to obtain the wet bulb and dry-bulb temperatures. Using these temperatures and a psychrometric table or chart, one can obtain the relative humidity. A detailed discussion of atmospheric humidity will be given in a later installment of this series.

Two catch pails should be provided for the water leaving the calorimeter.

Series prepared by Glenn M. Stearns, associate professor of petroleum engineering, University of Oklahoma

# Engineering Fundamentals

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

The meter and calorimeter should be electrically wired so that the water will be automatically diverted from one pail to the other at the completion of each revolution of the meter. The contents of one pail can be weighed on accurate scales while the other pail is filling. Readings of the temperature of the products of combustion, inlet and outlet water, and the gas at the meter should also be taken at the completion of each revolution of the meter.

A convenient length for the test is the period of time required for the passage of 2 cu. ft. of gas. Thus, when using a meter measuring 1/10 cu. ft. per revolution, there will be 20 readings of the temperatures and water weights to average in making the calculations.

Several corrections must be applied to the observed data, to compensate for variations from standard conditions. These corrections are:

1. Barometer correction to compensate for variations in density of mercury column with temperature (Table 1).

2. Humidity correction to allow for the water vapor in the air used for combustion (Table 2).

3. Corrections for difference between inlet water temperature and room temperature (Table 3).

Calculations from the observed data consist of:

1. Correcting metered volume of gas from meter pressure and temperature to a pressure of 30 in. of mercury at 32° F., and a temperature of 60° F., using the law of perfect gases.

2. Calculating observed heating value, using the equation:

$$H = \frac{W\,(T_o - T_i)}{V_2}$$

where

$H$ = observed heating value, B.t.u. per std. cu. ft.
$W$ = weight of water circulated, lb.
$V_2$ = corrected volume of gas burned, cu. ft.
$T_i$ = inlet water temperature, °F.
$T_o$ = outlet water temperature, °F.

3. Calculating gross heating value, as defined in Installment 36, by correcting the observed heating value for humidity and the difference between inlet water temperature and room temperature.

4. Calculating net heating value as defined in Installment 36, by correcting for humidity and the difference between inlet water temperature and room temperature, and then subtracting the latent heat of vaporization of the water condensate collected from the combustion space of the calorimeter.

**TABLE 2**

| Temp. of room °F. | Relative humidity of air (per cent) 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
|---|---|---|---|---|---|---|---|---|---|---|
| 40 | +4 | +3 | +3 | +2 | +2 | +1 | +1 | 0 | 0 | —1 |
| 45 | +4 | +4 | +3 | +3 | +2 | +1 | +1 | 0 | 0 | —1 |
| 50 | +5 | +5 | +4 | +3 | +3 | +2 | +1 | 0 | 0 | —1 |
| 55 | +6 | +6 | +5 | +4 | +3 | +2 | +1 | 0 | —1 | —1 |
| 60 | +8 | +7 | +6 | +4 | +3 | +2 | +1 | 0 | —1 | —2 |
| 65 | +9 | +8 | +7 | +5 | +4 | +3 | +2 | 0 | —1 | —2 |
| 70 | +11 | +9 | +8 | +6 | +5 | +3 | +2 | +1 | —1 | —2 |
| 75 | +13 | +11 | +10 | +8 | +6 | +4 | +3 | +1 | —1 | —3 |
| 80 | +15 | +13 | +11 | +9 | +7 | +5 | +3 | +1 | —1 | —3 |
| 85 | +18 | +16 | +13 | +11 | +9 | +6 | +4 | +1 | —2 | —4 |
| 90 | +21 | +19 | +16 | +13 | +10 | +7 | +4 | +1 | —2 | —5 |
| 95 | +25 | +22 | +19 | +16 | +12 | +8 | +5 | +1 | —2 | —6 |

**Example.**

*Problem.*—Given the following laboratory data from a flow calorimeter test of a natural gas:

| | |
|---|---|
| Volume of gas burned, cu. ft. | 2 |
| Average pressure at gas meter, in. water | 1.3 |
| Average gas temperature at meter, °F. | 70.5 |
| Average inlet temperature of water, °F. | 68.8 |
| Average outlet temperature of water, °F. | 82.7 |
| Average temperature of flue gas, °F. | 69.5 |
| Average room temperature, °F. | 71.7 |
| Total weight of water circulated, lb. | 147.2 |
| Barometer reading, in. mercury | 29.12 |
| Barometer temperature, °F. | 74 |
| Relative humidity of air, per cent | 49 |
| Weight of condensate collected, g. | 82.5 |

Calculate the gross heating value and the net heating value of the gas.

*Solution.*—A pressure of 1.8 in. of water, gage, is equal to 1.8/13.6, or 0.13 in. of mercury, gage.

The barometer correction from Table 1 is 0.12 in. of mercury. So, the corrected barometric pressure is (29.12 — 0.12), or 29 in. of mercury.

The absolute pressure of the gas at the meter is (29 + 0.13), or 29.13 in. of mercury.

**TABLE 3—CORRECTION IN B.T.U. PER DEGREE TEMPERATURE DIFFERENCE BETWEEN WATER INLET AND ROOM**

| Room Temp., °F. | For calculating total Ht. value | For calculating net Ht. value |
|---|---|---|
| 50 | 0.5 | 0.4 |
| 60 | .6 | .4 |
| 70 | .7 | .4 |
| 80 | .8 | .4 |
| 90 | .9 | .5 |
| 100 | 1.0 | .5 |

Correction to be added if water temperature is warmer than the room and subtracted if colder.

The volume of gas metered, when corrected to standard conditions, becomes

$$V_1 = \frac{V_2 P_2 T_1}{P_1 T_2}$$

$$= \frac{(2)\ (29.13)\ (60 + 460)}{(30)\ (70 + 460)}$$

$$= 1.905 \text{ standard cu. ft.}$$

(where Subscript 1 represents standard conditions and Subscript 2 represents meter conditions).

The observed heating value is

$$H = \frac{147.2\ (82.7 - 68.8)}{1.905}$$

$$= 1{,}074 \text{ B.t.u. per standard cu. ft.}$$

From Table 2, the humidity correction is + 5 B.t.u.

From Table 3, the correction is 2.9 × 0.7, or —2 B.t.u.

So, the gross heating value is (1,074 + 5 —2), or 1,077 Bt.u. per standard cu. ft.

The correction to be applied from Table 3 to the observed heating value in order to obtain net heating value is 2.9 × 0.4, or —1 B.t.u.

The latent heat of vaporization of water at average room temperature is about 2.3 B.t.u. per gram, and the amount of condensate collected on this test, in grams per standard cubic feet of gas burned was 82.5/1.905, or 43.31 g.

Then the latent heat of vaporization of the condensate from 1 standard cu. ft. of gas (generally termed reduction to net), is 43.31 × 2.3, or 100 B.t.u.

The net heating value of the gas, then, is (1,074 — 1 — 100), or 973 B.t.u. per standard cu. ft.

Note: For more detailed information on testing and calculations with the flow calorimeter, Bureau of Standards Circulars 32, 48, and 65 should be consulted.

Series prepared by Glenn M. Stearns, associate professor of petroleum engineering, University of Oklahoma

# REFINERY ACTIVITY AND EXPANSION

## Refiners Told of Numerous Opportunities for Converting Plants to Produce War Materials

OPPORTUNITIES are broad for further conversion of existing refining equipment to war purposes. This declaration was made last week in Pittsburgh, Pa., by Bruce K. Brown, assistant deputy petroleum coordinator and formerly a director of the Standard Oil Co. (Indiana), speaking at the annual meeting of the National Petroleum Association. The conversion program, Mr. Brown pointed out, is receiving government support, not as a method of keeping refineries operating which might otherwise be shut down, but rather as the most rapid and economical method of increasing output of war products at a minimum expenditure of new materials.

"The process," Mr. Brown said, "of converting existing refining equipment, idle or possible of being shut down without impairment of the basic petroleum economy, simply must go on.

"Just now isobutylene is very much needed although to make it physically available at the points where it can best be used, requires its conversion to diisobutylene. Some isobutylene is already finding its way into war products either as alkylate or as selective polymer. About 6,000 bbl. a day of additional isobutylene, as diisobutylene or selective polymer, is urgently required for aviation gasoline and if and when this need is satisfied very large additional quantities can be allocated to the manufacture of butyl rubber or flexon. Isobutylene can be recaptured from refinery gas streams by the installation of simple equipment using second-hand or spare units for the most part. PIWC committee reports available to all refiners have shown how this can be done and our refining division will gladly assist when possible. No contract with Government is required to dispose of the product since those refiners requiring it will purchase it and OPC will approve fair prices for the product. Priorities will be granted for new equipment required in the conversion provided that the project itself can meet OPC approval.

"Even more complicated war products are capable of production in converted equipment. One refiner is increasing alkylate production by the use of a 'homemade alkylation unit' thrown together in a few months out of existing spare equipment and I deeply regret that I cannot mention his name and thus provide a public compliment to his ingenuity.

"Benzene is another product which can be made by converting certain types of existing refining equipment. We shall need very large quantities of benzene within the next few months and I commend to your attention the possibility of contributing much to the war program by devising methods for producing and purifying benzene in our refineries.

"The possibilities of producing butadiene out of converted existing equipment—either alone or as a byproduct of a high temperature thermal cracking operation which also produces butylenes, isobutylene, and benzene, toluene and xylene is well known to you as the result of the refinery conversion program sponsored by PIWC and OPC endorsed, to the extent of 100,000 tons of butadiene per year, by the rubber survey committee. Conversions producing butadiene by both the butane-catalytic method and the high temperature thermal-cracking method have been approved by OPC, recommended by OPC to Rubber Reserve and, in some cases adopted as a part of the so called permanent-rubber program. Additional conversions to produce the extra supply of butadiene recommended by the Baruch survey committee are now under consideration.

"We need benzene for cumene and we can use any toluene and xylene available directly in aviation gasoline. We shall need butylenes for alkylate manufacture and isobutylene for either aviation gasoline or rubber. To the extent that we can produce these materials, purify them, and react them into finished products by using the nation's existing refining equipment we can perform a triple service. First, to produce vitally needed war materials; second, to produce them the fastest way; and third, to produce them with a minimum drain on the nation's capacity to produce direct engines of war."

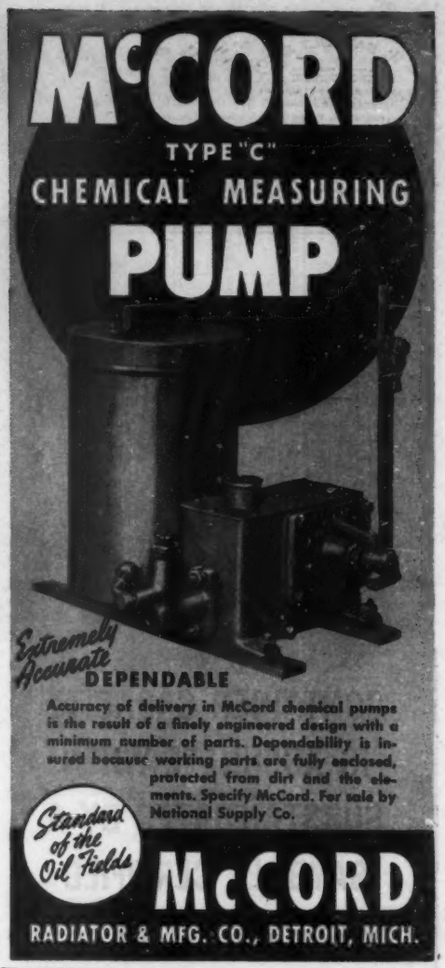
All of the benzene currently available to the refining industry is being used in the production of aviation-gasoline components, the N.P.A. audience was told.

"Enough polymerizations units, formerly operated to produce high-octane stocks for motor gasoline, have been converted to produce cumene —much sought after as a blending agent for aviation gasoline—to utilize all of the benzene available to us," Mr. Brown said. "Others of these units," he continued, "have been converted to the production of selective polymer (codimer), also to be used, after further treatment, in aviation gasoline. It behooves all refiners presently contributing materials to the aviation fuel and lubricants programs to continue such operations at the peak of efficiency and to complete such new manufacturing equipment as has been authorized at the earliest date possible."

### PanAmerican Refinery About Ready to Resume Operations

TEXAS CITY, Tex.—Operations will be resumed within a few days at the PanAmerican Refining Corp. plant here which has been idle since September 7 because of a fire. Don J. Smith, New York, vice president of PanAmerican Petroleum & Transport Co., in charge of refining, has been here for several days conferring with P. J. Sweeney, general manager of the refinery, on plans to resume operations.

Crude deliveries to the plant have been curtailed in the 2 weeks in which the refinery has been shut down. Producers connected to PanAmerican Pipe Line Co. were notified at last



McCORD
TYPE "C"
CHEMICAL MEASURING
PUMP
Extremely Accurate
DEPENDABLE
Accuracy of delivery in McCord chemical pumps is the result of a finely engineered design with a minimum number of parts. Dependability is insured because working parts are fully enclosed, protected from dirt and the elements. Specify McCord. For sale by National Supply Co.
Standard of the Oil Fields
McCORD
RADIATOR & MFG. CO., DETROIT, MICH.

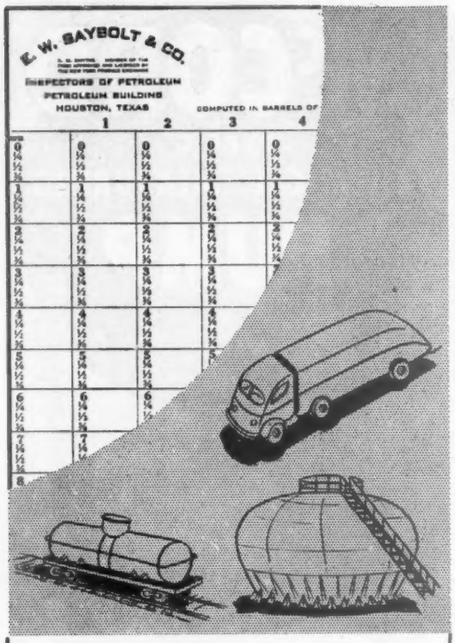
FACTORY TYPE
INSTRUMENT
RECONDITIONING

●

USED INSTRUMENTS
FOR SALE

●

INSTRUMENTS
INCORPORATED
DALLAS




CONTAINER CAPACITY IS ACCURATE WHEN SUBSTANTIATED BY A SAYBOLT CERTIFIED CAPACITY TABLE

★

OFFSHORE INSPECTION SAYBOLT SERVICE EVERYWHERE

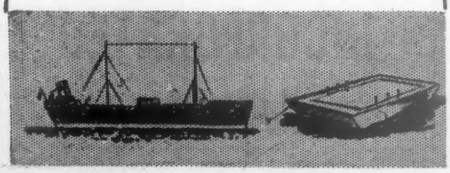
MEMBERS API—ASTM—SAE

LABORATORIES LOCATED AT:
NEW YORK, N. Y. HOUSTON, TEX.
PHILADELPHIA, PA. CORPUS CHRISTI, TEX.
NEW ORLEANS, LA. WILMINGTON, CALIF.

LABORATORY AND SAMPLING SERVICE AVAILABLE DAY AND NIGHT

E. W. SAYBOLT & CO.
*Inspectors of Petroleum*
PETROLEUM BUILDING
HOUSTON, TEXAS

★



## *Sketches of Plant Operators . . .*

R. R. JACKSON, superintendent of Magnolia Petroleum Co.'s large Gulf Coast refinery at Beaumont, Tex., combined a basic education in chemistry, practical operating experience, and inherent talents to qualify for the position he has held since 1936.

During the 6 years Mr. Jackson has been superintendent of the plant, Magnolia's Beaumont refinery has been equipped with the most modern processes and operating techniques developed by the industry to commercial status.

Mr. Jackson was born in Fort Worth, Tex., where he attended elementary and high schools, graduating in 1917 in time to serve with the Army in 2 years of the World War. One of the 2 years in military service was spent in France with the A.E.F.

At conclusion of the war, Mr. Jackson resumed his education at the University of Texas where he received a bachelor of science degree in chemical engineering in 1923. He was immediately employed by Magnolia at the Beaumont refinery as a chemist.

Two years later, in 1925, he was transferred to the operating department where he first worked on the coke stills, eventually being placed in charge of one of the departments.

Mr. Jackson became assistant superintendent of the plant in 1936 and later, in the same year, he was promoted to superintendent.

week's hearing of the Texas Railroad Commission at Austin that the refinery management hoped to make up for its inability to take full lease allowables during the period required for repairs. This hope is based on plans now pending OPC approval for expansion of the Texas City refinery, it was said.

### Two Regional Technical Meetings Arranged by W.P.R.A.

Programs have been completed for two regional technical meetings of the Western Petroleum Refiners Association, according to announcement of J. C. Day, secretary. First of these meetings will be held in Wichita, Kans., October 9; the second in Shreveport, La., October 30.

Three highly important technical papers are to be presented at each of the meetings, two of them at a morning session and the third in the afternoon. Since the war emergency is affecting the refining industry in a most vital manner, all papers for the regional meetings this year will deal largely with this emergency.

The complete program for the Wichita meeting is as follows:

"The Importance of Natural Gasoline and Its Derivatives to the Synthetic-Rubber and Aviation-Gasoline Programs," by Dr. Frank H. Dotterweich and Paul Raigorodsky, of the Natural Gas and Natural Gasoline Division, Office of the Petroleum Coordinator for War.

"Present-Day Furnace Design," by H. O. Johanson, M. H. Detrick Co.

"Synthetic Rubber," by Arch L. Foster, Phillips Petroleum Co.

Discussion from the floor will follow each paper.

Details of the program for the Shreveport meeting will be announced later.

The Wichita meeting will be held at the Allis Hotel, and that in Shreveport at the Washington-Youree.

### State Company Plans Refinery At Cartagena, Southern Spain

A new refinery is to be erected at Cartagena, situated in southeastern Spain on the Mediterranean. The plant will use for its raw products oils obtained from bituminous slates near Puertollano. Later the refinery will be used as a coal hydrogenation plant.

Projected by the Instituto Nacional de Industria, Spanish State industrial organization, the plant will be built of machinery a part of which will be purchased in Germany. Technical experts have already gone to Germany to study hydrogenation processes.

Initial capacity of the refinery will be more than 4,500 bbl. daily. The plant is so planned that it can be enlarged after the war, with the addition of a cracking plant. The Instituto plans to set up the plant as rapidly as possible, using the topping installation of the Teneriffe refinery. Difficulties in obtaining materials have slowed to some extent the progress of erecting the new plant.

### Refinery Gases to Be Used In Rumanian Rubber Plants

A synthetic rubber, "romacol," produced from a byproduct of the oil-refining industry, is to be manufactured in two plants in Rumania, according to British trade reports received by the U. S. Department of Commerce. A new company has been formed and authorized to draw upon public credit up to 100,000,000 lei (about $523,000), to be repaid within 3 years after production starts. In return, the Government has received 12,000,000 lei of founders' shares out of a total capitalization of 40,000,000 lei.

A new company has been formed under the corporate name of the Rumanian Co. for the Production of Romacol. Participants in the organization are Creditul Minier, Rumanian Chemical Works, and Rumanian Wire Industry Co.

### Gas & Oil Products Installs Poly Plant in Turner Valley

TURNER VALLEY, Alta. — A polymerization unit, the first of its kind in Canada, has been installed in the refinery of Gas & Oil Products, Ltd., in the Turner Valley field. The new plant makes possible the production of higher octane gasoline. Under the process high-refractory refinery gases, previously lost in the ordinary cracking process, are converted to liquid products. This, blended with ordinary cracked gasoline and tetraethyl lead, produces 78 and 80-octane gasoline. The plant output of poly fluid is about 2,000 gal. daily. The company is planning to add a desulfurizing unit which will make possible the production of 80-octane and possibly 87-octane gasoline.

## Impact of War Keeps Profit Trend of Industry Downward

*(Continued from Page 61)*

matter here. What happens to any industry cannot be considered adequately except in relation to changes in the entire economy or to changes in some grand division of the economy. Consequently, there is offered for your consideration similar data for the entire manufacturing industry for comparison with those of the oil industry. In the 1936-39 base period, the manufacturing industry received an average annual income of $15,590,000,000† or 22.9 per cent of the national income. It is estimated that, in the second quarter of this year, the manufacturing industry received income at the annual rate of $33,200,000,000, or 112.9 per cent greater than the base period.

### Lags Behind Manufacturing

In the 4-year base period, the average service rendered by the whole manufacturing industry, as indicated by the Federal Reserve Board's Index of Manufacturing Production, was 103, whereas in the second quarter of this year its service was at the rate of 182, the difference representing an increase of 76.7 per cent. Now, when these two sets of figures are put together to determine the income per unit of production, it is found that for each of the base years, on the average, there were $152,000,000 of income whereas in the second quarter of this year, the income per unit of production reached $182,000,000 or 20 per cent greater than in the base period. Clearly, from the premises adopted, it can be concluded that the petroleum industry currently is receiving relatively an appreciably lesser return for its services than the all-manufacturing group. Indeed if the oil industry were to receive just as much income per unit of service as the great all-manufacturing section of the economy, that is, if it were receiving currently 20 per cent more than in the base period, it would be receiving an overall income at the annual rate of $2,347,000,000 or $175,000,000 more than it is receiving, equal approximately to 14 cents per barrel. It is no mere coincidence that this figure approximates the combined estimates of the thus far uncompensated costs of compliance with governmental directives.

Our industry's current annual rate of over-all income is nearly $400,000,000 less than for 1941 and more than $100,000,000 less than for 1940 and that our income per unit of service rendered is currently less than in either of the 2 years named. On the other hand, the income of all manufacturing industries has risen by leaps and bounds, a wartime phenomenon clearly understood. However, the income of the manufacturing section of the economy per unit of service rendered has, unlike that of the petroleum industry, risen steadily from an index of 106.5 in 1940 to 112.5 in 1941 and to an estimated 120 in the second quarter of 1942.

The intense individualism which characterized the operations of the industry in the years between the abandonment of the NRA and the current issuance by wartime governmental agencies of orders, recommendations and directives, all calculated to bring about the reduction of competition and the institution of cooperation in its place, is having now a marked effect upon the competitive structure of the industry. This trend instantly raises the question: Are we headed for another Madison? Many informed persons think so. But I think we may dismiss the question summarily, first, because of assurances provided by legislation that cessation of governmentally inspired cooperative efforts at the end of the emergency will leave the cooperators immune from antitrust action.

†Income produced used throughout.

### Economic Planning Complex

To the exponents of economic planning and to superficial observers, wartime substitution of various forms of cooperative effort for competitive effort is bringing about reductions in the use of manpower, fuel and supplies, in raw material losses and in other elements of the cost of doing business, particularly in transportation, refining and marketing. These are objectives of the administration of a policy borrowed from British practices. It is called "Concentration of Industry." By the same general processes, crosshauling is reduced or eliminated, advertising reduced and the expense of duplicatory operations minimized. The apparently improved over-all status of the industry seems to bespeak the benefits of a planned economy. But a hastily reached conclusion to that effect may result in grave error. In the first place, the changes are possible only because of the exigencies of the war; in the second place, the favorable factors are offset by the loss to the public of service of great but undetermined value; and, in the third place, there is only one crop of improvements possible by the procedure of concentration and cooperation. Thereafter, any progress to be achieved must be through the exercise of initiative as in the free enterprise system which has brought us to our present high state of economic development.

The competitive structure of the industry is also being changed permanently by other forces originating in and growing through the war period. One of these is the industry's altered transportation pattern. It is a change traceable directly to the loss of tankers by enemy action and by diversion to the armed services. The expansion in the use of existing pipe lines; the large investments in new pipe lines and in barges operating on the nation's waterways and in terminals; the increased use of motor vehicles for bulk hauling; the accelerated use and consequent depreciation of tank cars; the increased use of exchange-of-products procedure; and the reduction of crosshauls previously mentioned, all forecast changes which will be noticeable after the emergency.

### May Reduce Costs

One effect of these changes, certain other economic factors remaining constant, will be a relative reduction in the cost of doing business. This, it would seem, is one of the inevitabilities. Inevitableness, respecting the future conditions of economic activity is one of the lessons to be learned in the present period. Something of what is yet to be must be foreseen and accommodations provided accordingly. Otherwise, the war will leave in its wake a trail of economic disablements due mostly, if not solely, to lack of adjustment to the developing new conditions.

One of these new conditions is being created by what is perhaps one of the biggest changes in the affairs of the industry, namely, the enhancement of the chemical character of its refining branch. Already this change has improved the position of the refining branch among the several branches of the industry and it seems destined to effect even greater changes. The interval between the raw material and the quality of finished products must widen, not perhaps in terms of market value but in terms of practical utility. Daily, in the development and use of petroleum products, the economic principle of "more and more from less and less" is being invoked. It is even conceivable that the curve of fuel consumption of surface automative equipment might rapidly flatten out or even turn downward as a result of the use of above 100-octane fuels in engines 25 per cent to 50 per cent mor efficient than those of the prewar period. Similarly, in the development of superior cetane number fuels for diesel engines and in the development of long-life turbine, automotive and other lubricating oils. No doubt, the total refinery throughput will be influenced greatly by the future demand for so-called heavy residual fuel oils. Here, there is expanded the minimum of refining processes. Continued demand tends to keep alive less progressive refineries.

The competitive structure of the industry is being altered, probably in a permanent way, also by the discontinuance, and in many instances, no doubt, abandonment, of retail outlets for the sale of petroleum automotive products. Currently, it is rumored in Washington that three out of four such outlets must give up their manpower to the needs of wartime industry, a possibility that delights those critics of the industry who have long maintained the existence of a state of overdevelopment in the retail branch of the business. Several years ago, before this very body in annual meeting at Atlantic City, I offered an economic explanation of the existence of the alleged superfluity of stations and endeavored to show how they were a natural part of the economy then existing.

The slowing down in the rate of development of crude-oil reserves is a wartime change of considerable significance. The reduction in oil-field developments may be attributed wholly to the administration of governmental directives. Its significance grows largely out of the fact that in governmental circles the belief exists that there are crude-oil reserves adequate to meet current military, industrial and civilian needs.

### Control by Fiat

Perhaps the most notable of all wartime changes in the petroleum economy are those collectively arising from the imposition of control over the operation of the industry by governmental agencies. It is remarkable what can be done to an industry when some important element of its affairs are controlled fairly rigidly by fiat. Perhaps the most important control of all is that exercised over the prices of the industry's new materials and products. Price control as administered during the present emergency is not merely antiinflationary, it is probably definitely deflationary. It has a marked relation to the supply of products although it is pretty obvious that the relation between price control and the magnitude of supply is as yet undetermined.

Governmental control over an industry's development of productive capacity, by withholding from it materials and supplies needed for that development, is also a potent form of control. It not only affects intraindustry competition but also interindustry competition. The subleties of this influence cannot be perceived by agency planners. It is difficult, if not impossible, to predetermine even the major efforts of the administration of directives. The governmental agencies which influence our operations will certainly continue for the duration of the war. The question which concerns us now, however, is whether they will have a permanent effect upon our industry and, also, whether they will be continued after the war. The second of these questions can be assigned to the field of politics; the first one may be answered by appraisals of the degrees of usefulness which the functions they have exercised during the war might provide in the postwar period. My opinion is that their outstanding demonstration consists of showing how difficult it is to conduct economic planning in a complex society. Economic planning, to work well in such a society, must be supported by superlative coordination. The achievement of coordination has been the greatest difficulty in the work of governmental agencies having to do with the petroleum industry.

"CLEVELANDS"

An Outstanding Contribution to PIPELINE CONSTRUCTION

THE CLEVELAND TRENCHER CO.
*"Pioneer of the Small Trencher"*
20100 ST. CLAIR AVE. - - - - - CLEVELAND, OHIO

PETROLEUM PRODUCTION

By Wilbur F. Cloud

COMPLETE and UP-TO-DATE

*3rd Large Printing Now Ready*

"To be commended as a general approach and contribution to the current needs of students, petroleum engineers, and operators in the oil and gas-producing industry."—*Bulletin American Association Petroleum Engineers.*

"Large portions are of popular interest and should appeal to the lease- and royalty-owning layman."—*Dallas Morning News.*

$5.00

*Order Now From:*

Book Department
OIL AND GAS JOURNAL

# *Pipe-Line Activity*

## Subcommittee Completes Report on Corpus Christi-Beaumont Line

THE subcommittee recently appointed by the transportation committee of District 3 to study the feasibility of the construction of a crude line from Corpus Christi to the Houston-Beaumont area in Texas, has completed work according to an announcement by J. A. Neath, chairman.

The pipe line if constructed will be capable of delivering between 65,000 and 75,000 bbl. of crude and products daily, and its construction will be made possible by the conversion of existing gas lines and some new construction which will be done with used pipe.

Construction of the line will depend largely upon a decision which is to be made by the general committee of Districts 1, 2 and 3 to determine whether or not Southwest Texas crudes and products will be required for delivery directly to the 24-in. line now under construction from East Texas to Illinois or whether this crude is required as replacement at Houston-Beaumont refineries for oil diverted to the East Texas-Illinois line. This is to be determined by the general committee at an early date.

While physical arrangements for this line have been made, the subcommittee has not explained financial arrangements.

### Sinclair Seeks Permit to Move Pipe to Gulf Coast

The Railroad Commission of Texas set for hearing September 29 the application of Sinclair Refining Co. for authority to move an 8-in. line from Kingsmill station, in Gray County, Texas, to the Texas-Oklahoma border and from near Borger, Tex., to Kingsmill to the Gulf Coast.

Total length of the line is 93.3 miles.

Gulf Coast pipe lines were reported by the commission to be hard pressed to meet demands for delivery of petroleum necessary to the war effort and it was believed likely the application would be granted.

Pipe removed from the Panhandle, according to Sinclair's plans, is to be relaid in the Gulf Coast together with other pipe removed from the Oklahoma boundary to Adding station near Ringling, Okla. This old pipe is to be used in a new line to connect the Corpus Christi, Tex., area with Sinclair's Damon Mound, Tex., station.

According to reports, the removal of 8-in. pipe from the Panhandle outlet to the Gulf Coast is being done to make it possible for Sinclair to purchase and ship crude from the Corpus Christi area to the company's refinery at Houston, Tex. A result of this would be that a certain amount of East Texas crude would be released for shipment eastward through the 24-in. War Emergency line.

### Plantation Extension to Richmond Financed by RFC

WASHINGTON, D. C.—Jesse Jones, secretary of Commerce, last week announced that Defense Plant Corp., upon the recommendation of the Office of Petroleum Coordinator for War, has agreed to finance the construction of an 8-in. pipe line from Greensboro, N. C., to a point near Richmond, Va., a distance of about 175 miles.

The line will be built of second-hand pipe and will provide, together with a privately financed feeder line now under construction from the Houston-Beaumont area of Texas to Baton Rouge, La., a through pipe-line movement to the East Coast of petroleum products originating in the Texas-Gulf Coast area.

The Plantation Pipe Line Co., a Delaware corporation, will construct the line. It will have a capacity of about 30,000 bbl. per day of gasoline and light products, and it is expected that it can be in operation in approximately 4 months. The facilities will be owned by DPC and will be operated for its account.

The Plantation Pipe Line Co. now has a line from Baton Rouge to Greensboro with a daily capacity of 60,000 bbl. This will be increased 30,000 bbl. daily by installation of additional pumping stations along this line.

### W. Alton Jones Visits War Emergency Project

Crude oil will begin flowing through the 550-mile pipe line from Longview, Tex., to Norris City, Ill., by January 1 to alleviate a fuel shortage in eastern states, W. Alton Jones, president of the War Emergency Pipelines, Inc., said last week.

While the line will average about 300,000 bbl. daily, Mr. Jones reported, the rate of flow to the eastern seaboard will be only about 125,000 to 175,000 bbl. a day unless another pipe line from Illinois to the coast is completed.

Mr. Jones said plans were in the making for the Illinois-East Coast pipe line but the project was being held up because of the steel shortage.

"We do not think the Texas-Illinois pipe line will solve the problem," Mr. Jones declared, "but it will help to shorten the tank-car haul from southwestern oil-producing states."

Mr. Jones, who also is president of Cities Service Oil Co., was in Little Rock, Ark., with Deputy Petroleum Coordinator Ralph K. Davies and Samuel H. Husbands, president of Defense Plant Corp., and his aide, Benjamin Covington, to inspect pipe-line construction work in the Little Rock area.

The Little Rock office of the WEP reported that about 135 miles of the line had been completed the first of this week and that the actual laying of pipe would be finished about December 1. An additional month will be required to erect tank reserve stations, 10 pumping relay stations and other facilities.

Two river crossings have been entirely completed and two other river crossings are half completed.

Mr. Jones said construction work was proceeding on schedule.

While the pipe line at first will transport crude oils, Mr. Davies said gasoline could be fed through the lines with but little time for change over if the necessity arose.

Petroleum Coordinator Harold Ickes said last week that approximately 300 miles of pipe has

been delivered in addition to pipe which has been welded in the line.

He added that the proposal for construction of a great number of wooden barges for movement of oil appeared to be "moribund." He explained that the major difficulty encountered was in getting diesel engines needed to haul the barges.

## Texas Panhandle Pipe Lines Increase Crude Runs

Purchasers of crude oil in the Panhandle field of Northwest Texas stepped up their runs the past fiscal week, taking 86,514 bbl. a day as follows:

| | Past week | | Previous week | |
|---|---|---|---|---|
| Counties— | Wells | Output | Wells | Output |
| Carson | 638 | 10,679 | 637 | 6,937 |
| Gray | 2,461 | 41,720 | 2,459 | 29,941 |
| Hutchinson | 2,028 | 30,163 | 2,026 | 21,403 |
| Moore | 15 | 410 | 15 | 410 |
| Wheeler | 422 | 3,542 | 422 | 3,766 |
| Total | 5,644 | 86,514 | 5,355 | 62,457 |

## Sohio Surveys for Outlet To Socony-Vacuum System

For the purpose of connecting the St. Jacobs pool, Madison County, Illinois, with the main trunk line of Socony-Vacuum north of the field, Sohio interests are surveying a pipe-line route. The Socony-Vacuum crude-oil pipe-line system extends from the East St. Louis refining area to Lima, Ohio.

## Unusual Solutions Reached For 1942 Pump Problems

One of the problems facing designers of major gasoline pipe lines is that of making advance provision for changes which can be made economically for handling increased loads.

Builders of the Plantation products line, completed early this year, contemplated increasing capacity by 50 per cent some time in the future. Shortly after the line went into operation, a demand was made for this increased capacity because of the disruption of transportation due to the sinking of tankers by submarines. The change was readily effected because of the manner in which pumps and motors had been designed. The centrifugal pumps were made so that impellers could be removed and replaced by impellers of the same diameters but larger capacity. This could be done without affecting the original mechanical efficiency of the pumps.

Engineers met the company's problem with a unique development of the double-rated-horsepower motor, 600 to 900 hp. for the 12-in. section of the trunk line and 450 to 600 hp. for the 10-in. section. Motors are explosion-resisting induction type, requiring special starting voltage of not less than 92 per cent of the full-load running voltage. When pumping through this line at the rate of 60,000 bbl. per day, fluid moves 5 ft. per second; when pumping 90,000 bbl. per day fluid move 7½ ft. per second.

In the preliminary work done in preparing for the 24-in. crude-oil pipe line for moving shipments destined for relieving the East Coast, difficult problems were encountered in the design of the pumps where an effort was made to use the conventional pattern of pipe-line pumps with three or four stages of impellers housed in one casing, each stage capable of generating 250 to 300 ft. of head. Consideration had to be given to passing 7,500 to 8,000 g.p.m. through short curved tubes from one stage to another in the same casing to obtain a balanced thrust on the propeller shaft. This treatment avoided excessive friction loss and also prevented cavitation in the first stages which would greatly reduce the efficiency of the pump.

Pump manufacturers overcome difficulties by offering three single-stage pumps, each capable of developing one-third of the initial pressure; all three units to be operated in series for the maximum capacity desired. The over-all guaranteed efficiency possible with this type of design is 5 to 8 per cent greater than could have been assured with impellers housed in one casing.

## Tank-Car Shipments Reach New Record of 838,440 Bbl. Daily

WASHINGTON, D. C.—Tank-car shipments of oil to the East Coast shattered all previous records with an average of 838,440 bbl. daily for the week ending September 12.

This is an increase of 13,590 bbl. daily over the volume moved in the previous week, when car loadings averaged 824,850 bbl. daily. The former record was 830,820 bbl. daily, established in the week ending August 15.

In shipping 838,440 bbl. daily to the seaboard, 33 companies loaded 27,948 cars. On a basis of an average of 210 bbl. per car, these cars carried the equivalent of 5,869,080 bbl. of petroleum and petroleum products during the week.

Eastern shipments by companies were—

Allied Oil Co., 20 cars; American Bitumuls, 37; American Mineral Spirits Co., 234; Arkansas Fuel Oil Co., 190; Ashland Oil & Refining Co., 153; Asiatic Petroleum Co., 13; Atlantic Refining Co., 2,963; Aurora Gasoline Co., 35; Chalmette Oil Co., 57; Cities Service Oil Co., 1,554; Continental Oil Co., 167; Crown Central Petroleum Co., 7; Daugherty Refinery, 19; Gulf Oil Corp., 2,130; Hartol Products, 337; National Refining Co., 5; Pan American, 1,825; Petrol Corp., 252; Petroleum Heat & Power Co., 222; Phillips Petroleum Co., 46; Pure Oil Co., 332; Roosevelt Oil Co., 6; Royal Petroleum Co., 5; Shell Oil Co., 1,181; Sinclair Refining Co., 2,858; Socony-Vacuum Oil Co., 3,086; Standard Oil Co. of Kentucky, 335; Standard Oil Co. of New Jersey, 4,701; Standard Oil Co. of Ohio, 56; Sun Oil Co., 2,043; Talco Asphalt & Refining Co., 104; Texas Co., 2,149; and Tide Water Associated Oil Co., 826.


*This inexpensive unit stops*

**CORROSION**

*of pipelines!*

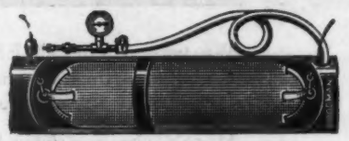
*Now, more than ever, that's important. This is a War against Waste, . . . waste of oil, . . . waste of vital materials.*

*The REXSELEN Corrosion-Eliminator is not expensive, nor hard to install. It requires no attention after it is once in service.*

*Year in and year out it fights off the insidious destruction caused by corrosion. Why not let it save money and oil and pipe for you? May we send you the facts?*

**ELECTRICAL FACILITIES, Inc.**
4226 Holden St. Oakland, California

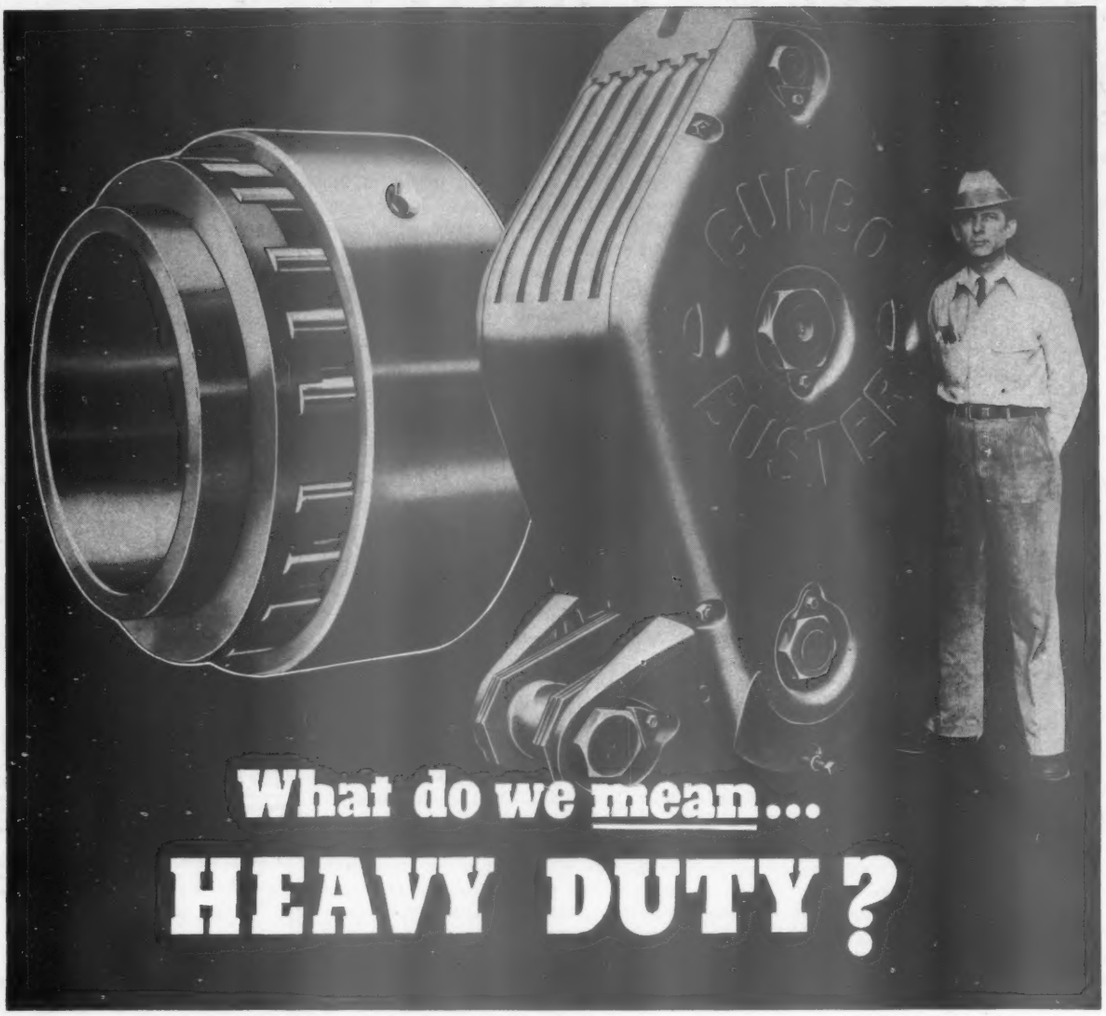
**STOPPERS FOR OIL AND GAS LINES**



Send for catalogue
**SAFETY GAS MAIN STOPPER COMPANY**
523 Atlantic Ave. Brooklyn, N. Y.

**CHAS. MARTIN & COMPANY**
*Inspectors of Petroleum*
Approved and Licensed by New York Produce Exchange
GAUGING • SAMPLING AND TESTING • TANK STRAPPING
BARGE CALIBRATION • CRUDE CLASSIFICATION • GAS ANALYSIS
1215 Dumble Street, Houston, Texas
*Laboratories located at:*
Houston, Texas Corpus Christi, Texas
New Orleans, La. Jennings, La.
Elizabeth, New Jersey
New York Office: Produce Exchange Annex
*Branch offices at all oil ports*

**T. and L. CONSTRUCTION COMPANY**
**PIPE LINE CONTRACTORS**
Centralia, Illinois
Phone 2653 - P. O. Box No. 79




We named 'em AMERICAN *HEAVY DUTY* Roller Bearings 25 years ago . . . and their *performance* has made that name "stick" ever since.

Here's what we mean by HEAVY DUTY:

Take the toughest, most abusive, gruelling continuous service you can think of . . . the most ponderous, powerful equipment needed for that kind of job. Put AMERICANS into *that* equipment for *that* service and they will function smoothly, flawlessly, with *minimum* maintenance for maximum periods . . . often outlasting the equipment itself. Engineered to withstand terrific strains and stresses, they are brutally strong beyond expected needs yet precise as a fine watch in operation.

That's why most major manufacturers of oil country equipment and many producers of industrial machinery specify AMERICANS *only.*

HEAVY DUTY? We'll say they are!

AMERICAN ROLLER BEARING COMPANY
PITTSBURGH, PENNSYLVANIA
*Pacific Coast Office:* 1718 S. Flower Street, Los Angeles, California

AMERICAN
HEAVY-DUTY
ROLLER BEARINGS

# FIELD DEVELOPMENTS...

## HIGHLIGHTS FROM THE WEEK'S NEWS—

Once upon a time states like Kansas and Wisconsin were considered legislative laboratories where new ideas in government were tried out. When Washington assumed this role people who had speculated about what might happen to them next focussed most of their attention on the national capital. A survey of reports from Canada as published weekly in the Journal suggests that more than a passing glance should be thrown in the direction of Ottawa. Among the innovations introduced in Canada during recent months, at least as experiments, are such things as income-tax credit on receipts from production for expenditures on wildcats, the drilling of wildcats by provincial governments with the aid of the federal Geological Survey, federal aid in expediting the importation of oil-field and refinery equipment, attempts to revive a bonus of 1½ cents a gallon for stripper production. The Canadian Government, together with leading transportation and mining companies is taking an active interest in the development of the tar sands of the Athabaska.

Of course, government agencies other than OPC are becoming closely identified with the oil industry in the United States. This week, the Navy is reported to be taking over the drilling and production of oil in its Elk Hills reserve and another government agency is already in the pipe-line business and is now taking over a nearly depleted field in California for gas storage to meet peak demands in the Los Angeles district.

These developments, unlike the announced intention of OPC to dissolve after the war may continue in operation indefinitely. It may be that with a little practical experience in the oil business the Government will have a better idea of what the oil industry is up against but it is more likely that government-operated properties will be used as yardsticks to regulate the industry after the manner of the Tennessee Valley Authority and the utilities.

To turn to a more pleasing subject, it is quite possible that 1942 will see more states opened to production than in any previous year. In the spring, production was reported from Virginia and this week there are reports that an oil sand has been penetrated in a wildcat in Oregon. Unconfirmed reports persist of showings in wells drilled in the Puget Sound district in Washington and although news from the Dakotas has not been very encouraging of late, drilling is still continuing.

Last month the Canadian Department of Trade and Commerce reported an increase in production in the Northwest Territories from 500 bbl. in May to 333,494 bbl. in June. This increase representing a 33 1/3 per cent rise for Canada in a single month caused much interest and speculation. This month the department issued corrected figures which show a small increase in production from this area and then carried the correction back to February. Activity in this area is increasing but little news comes out of it.

**OREGON:** It is reported that a 70-ft. oil sand has been found in a wildcat near Burns, Harney County. If successful, this well will make Oregon the second state added to the list of producers this year, Virginia being the first (p. 237).

**SOUTHWEST TEXAS:** Tests of showings in the Carrizo-Wilcox in the old Pettus field, Bee County, and in the upper part of the Wilcox at Nordheim, De Witt County, are maintaining interest in the western sector of this trend (p. 239).

**CALIFORNIA:** The project to store gas in the almost depleted Playa Del Rey field is moving ahead. Although the discovery at Suisun is not yet completed owing to mechanical trouble a second well is being started. The Navy plans to do its own drilling and development of its Elk Hills reserve (p. 227).

**NORTH TEXAS:** A new Ellenburger producing area has been opened up in Archer County west of Vogtsberger and Simpson and Ellenburger showings are being tested in Montague County wildcats (p. 235).

**WEST TEXAS:** The proven areas in Andrews County continue to expand as extensions to the Mascho and West Andrews fields are reported. Production is also reported from a wildcat in southern Gaines County. Showings are reported in a wildcat on the west flank of the Fort Stockton high (p. 232).

**LOUISIANA GULF COAST:** Two locations have been staked in the new Bayou Couba area northwest of New Orleans, although tests are not yet completed on the discovery. Bayou Sale is extended 4,000 ft. east and the deep sand at West Gueydan is extended south (p. 231).

**TEXAS GULF COAST:** Showings have been logged in the Wilcox in wildcats in Austin and Montgomery counties (p. 230).

**MICHIGAN:** A new field has been opened in Missaukee County 12 miles north of Winterfield-Clare (p. 226).

**WYOMING:** Embar production has been proved in the shallow Circle Ridge field which now has two pays above 660 ft. (p. 237).

**ILLINOIS:** Spurred by Amendment 5 to M-68 another drilling campaign is under way. A southwest outpost to the Rural Hill field showed oil in the Aux Vases and is testing (p. 226).

**OKLAHOMA:** Extension attempts are under way in the Guthrie and Jesse pools and a test has been started between the new Liberty pool and Marathon in Noble County (p. 229).

**KANSAS:** A new gas field has been opened in Edwards County north of the abandoned McCarty gas field. The pay is in the Lansing. Doran and Brandenstein may be linked by an Arbuckle well (p. 239).

**ALBERTA:** Attempts are being made to develop production in the Athabaska River district above the tar sands area. Both oil and gas were reported from a test drilled in this area some years ago (p. 240).

## COMPLETIONS IN ALL FIELDS . . .

(Week Ended September 19, 1942)

| | Oil | Gas | Dry | Total | Footage | Ttl. comp. to date 1942 | Ttl. comp. to date 1941 |
|---|---|---|---|---|---|---|---|
| N. Y., Pa., and W. Va. | 44 | 15 | 4 | 63 | 117,424 | 2,554 | 4,252 |
| Ohio | 0 | 11 | 10 | 21 | 49,522 | 814 | 1,193 |
| Indiana | 3 | 0 | 2 | 5 | 7,946 | 256 | 365 |
| Kentucky | 1 | 3 | 1 | 5 | 11,961 | 210 | 470 |
| Illinois | 25 | 0 | 23 | 48 | 124,372 | 1,293 | 2,543 |
| Michigan | 9 | 2 | 8 | 19 | 55,913 | 520 | 622 |
| Kansas | 26 | 2 | 13 | 41 | 132,670 | 1,162 | 1,583 |
| Nebraska | 0 | 0 | 0 | 0 | 0 | 26 | 69 |
| Missouri, Iowa | 0 | 0 | 0 | 0 | 0 | 10 | 26 |
| Oklahoma | 11 | 3 | 8 | 22 | 72,668 | 888 | 1,378 |
| Texas: | | | | | | | |
| North Central Texas | 8 | 0 | 14 | 22 | 59,321 | 864 | 2,045 |
| West Texas | 18 | 1 | 1 | 20 | 95,034 | 1,039 | 1,609 |
| Texas Panhandle | 4 | 4 | 1 | 9 | 30,149 | 288 | 467 |
| Eastern Texas | 5 | 1 | 3 | 9 | 56,810 | 296 | 776 |
| Texas Gulf Coast | 6 | 4 | 4 | 14 | 84,648 | 548 | 798 |
| Southwest Texas | 8 | 1 | 4 | 13 | 64,793 | 815 | 1,332 |
| Total Texas | 49 | 11 | 27 | 87 | 390,755 | 3,850 | 7,027 |
| North Louisiana | 4 | 0 | 3 | 7 | 28,810 | 358 | 520 |
| Louisiana Gulf Coast | 9 | 0 | 4 | 13 | 125,190 | 385 | 642 |
| Total Louisiana | 13 | 0 | 7 | 20 | 154,000 | 743 | 1,162 |
| Arkansas | 5 | 0 | 2 | 7 | 49,301 | 132 | 134 |
| Mississippi and Southeast | 0 | 0 | 0 | 0 | 0 | 56 | 185 |
| Montana | 1 | 1 | 0 | 2 | 5,698 | 139 | 207 |
| Wyoming | 2 | 0 | 0 | 2 | 4,364 | 78 | 141 |
| Colorado, Utah | 1 | 0 | 0 | 1 | 900 | 14 | 25 |
| New Mexico | 1 | 0 | 0 | 1 | 3,170 | 195 | 205 |
| California | 4 | 0 | 8 | 12 | 53,721 | 537 | 809 |
| Total United States | 195 | 48 | 113 | 356 | 1,234,385 | 13,467 | 23,296 |
| Total previous week | 173 | 57 | 101 | 331 | | | |
| Week ended Sept. 20, 1941 | 512 | 52 | 133 | 697 | | | |

## ILLINOIS FIELD REPORT

# Illinois Basin Operations Continue on Upward Trend

MATTOON, Ill.—While M-68, the original well-spacing rule of the War Production Board and Office of Petroleum Coordinator has curtailed drilling in all states, it has laid a particularly heavy restraint on field work in Illinois. A survey of work during the first 8 months shows that 1,215 wells were completed in that state, while 2,300 tests were completed during the same period last year. This represents a decline of 47 per cent. As of September 1, 215 operations were reported under way, a 54 per cent decline as compared to the ninth month of last year.

However, since M-68-5 has come into existence in Illinois, Indiana and Kentucky, operators in Illinois have spudded at least 60 tests that could not have been started under the original rule. In addition, several more tests have been staked and many others are being considered.

### Rural Hill Outpost Testing

Tide Water Associated Oil Co. is making a drill-stem test on the 1 L. Dennis, SE SE SE 27-6s-15e, southwest of the Rural Hill pool in Hamilton County and northwest of the Ohio Oil Co. production about 1½ miles south of the field. No. 1 Dennis cored the Aux Vases sand at 3,252-61 ft. and recovered 5 ft. of saturated sand. Some difficulty was encountered in running an electric log, but operators have completed the job, and are now making a test of the sand.

Plug was scheduled to be drilled during the week end at E. Frank Jones 2 Harrison, SE NW 2-2n-2w, likely looking Devonian producer in the Boulder pool. Operators encountered a show of saturation at 2,610 ft. and recovered a heavily saturated core from 2,633-40 ft. Pipe has been set to 2,648 ft.

G. E. Skiles is installing pumping equipment at 1 Wheatley, new pool opener about 4 miles northwest of Mount Carmel. No. 1 Wheatley encountered the Benoist sand at 2,464 ft. and was drilled to a total depth of 2,477 ft. A drill-stem test at 2,461-77 ft. recovered 70 ft. of oil and 50 ft. of mud in 35 minutes. The well has been given a 20-qt. shot at 2,466-76 ft.

In Gallatin County, A. W. Cherry and Barron Kidd have set casing on the Palestine sand at 1,839-59 ft. in the 1 Mary Kerwin, NE NE SW 11-8s-10e, about 4 miles southeast of New Haven and about a mile northeast of the East Inman pool. A 30-minute drill-stem test on the sand showed 1,200 ft. of oil and 200 ft. of water.

### ILLINOIS COMPLETIONS

#### Wildcats

Clay County: Texas 1 V. C. Wright, NW NE SE 3-5n-5e, dry at 2,544 ft., Golconda 2,076 ft., Barlow 2,131 ft., Weiler 2,184 ft., Paint Creek 2,245 ft., Benoist 2,315 ft., Renault 2,353 ft., Aux Vases 2,362 ft., Ste. Genevieve 2,417 ft., McClosky 2,458 ft.

Eason et al 1 Barbee, SW SW SE 35-5n-6e, pumped 216 bbl., perf. 2,789-94 ft., 1,500 gal. acid, perf. 2,789-94 ft., 5,000 gal. acid, McClosky 2,790-99 ft., T.D. 2,887 ft., *pool opener.*

Clinton County: H. A. Harman 1 M. Reed, SW SW 1-2n-2w, dry at 340 ft.

Coles County: B. F. Williams 1 H. F. Brown, NW SE SE 36-14n-7e, dry at 1,900 ft., Glen Dean 1,525 ft., Golconda 1,600 ft., Cypress 1,646 ft., Paint Creek sand 1,735 ft., Ste. Genevieve 1,831 ft.

C. E. Green 1 P. Link, NW NE NE 9-12n-14w, dry, Louisiana 1,280 ft., Chattanooga 1,290 ft., Devonian 1,383 ft., Trenton 2,324 ft., old well deepened from 1,725-2,586 ft.

Fayette County: Troupe & Larson 2 Larimore, SE NE NE 25-9n-3e, dry at 1,588 ft., Glen Dean 1,398 ft., Benoist 1,575 ft.

Gallatin County: N. V. Duncan 1 S. S. Knight, NE NE NW 22-7s-9e, dry at 3,082 ft., Kincaid 1,910 ft., Degonia 1,929 ft., Palestine 2,066 ft., Menard 2,133 ft., Tar Springs sand 2,287 ft., Glen Dean 2,377 ft., Golconda 2,485 ft., Cypress sand 2,638 ft., Paint Creek 2,714 ft., Bethel 2,815 ft., Renault 2,838 ft., Aux Vases 2,884 ft., Ste. Genevieve 2,930 ft., St. Louis 3,076 ft.

Jefferson County: Ruwaldt et al 1 Mace, NE SE 33-3s-3e, pumped 103 bbl., perf. 2,771-2,806 ft., 500 gal. acid, reacidized 2,000 gal., Rosiclare 2,771-82 ft., T.D. 2,848 ft.

Texas 1 H. E. Crouch, SW SW SE 16-3s-3e, dry at 4,759 ft., Glen Dean 2,720 ft., Hardinsburg 2,315 ft., Golconda 2,353 ft., Cypress 2,478 ft., Weiler 2,501 ft., Benoist 2,660 ft., Renault 2,708 ft., Ste. Genevieve 2,755 ft., Rosiclare 2,839 ft., Fredonia 2,920 ft., Devonian 4,520 ft.

Magnolia 1 Branson, SW SE 13-1s-4e, dry at 3,069 ft., Menard 2,142 ft., Tar Springs 2,266 ft., Glen Dean 2,383 ft., Cypress 2,580 ft., Aux Vases 2,860 ft., Levias 2,915 ft., Rosiclare 2,938 ft., McClosky 2,965 ft., St. Louis 3,058 ft.

Madison County: Watkins Drlg. et al 1 Zeigler, SW NW SE 3-3n-6w, dry at 2,479 ft., Cypress sand 610 ft., St. Louis 868 ft., Devonian 1,795 ft., Trenton 2,460 ft.

Marion County: Skiles 1 Barnhouse, NW NE 28-1n-2e, dry at 2,190 ft., Glen Dean 1,577 ft., Barlow 1,761 ft., Cypress sand 1,798 ft., Benoist sand 1,929 ft., Aux Vases sand 1,992 ft., Ste. Genevieve 2,075 ft., Fredonia 2,120 ft., McClosky 2,130 ft.

St. Clair County: T. R. Kerwine 1 Harbaugh, NW NE SW 28-2n-8w, dry at 1,396 ft., Devonian 1,060 ft., Trenton 1,356 ft.

Wabash County: Lewis Bros. 1 King, NE NW SW 16-1n-12w, dry at 2,298 ft., Glen Dean 1,756 ft., Hardinsburg 1,800 ft., Golconda, 1,869 ft., Barlow 1,959 ft., Cypress sand 1,981 ft., Weiler 2,060 ft., Paint Creek 2,084 ft., Benoist sand 2,145 ft., Renault 2,190 ft., Aux Vases sand 2,252 ft., Ste. Genevieve 2,271 ft., McClosky 2,292 ft.

Wayne County: Hamm & Wright 1 Cisne, E½ NW SW 8-1n-7e, dry at 3,252 ft., Menard 2,387 ft., Tar Springs 2,526 ft., Glen Dean 2,586 ft., Hardinsburg 2,657 ft., Golconda 2,705 ft., Barlow 2,816 ft., Paint Creek 2,968 ft., Bethel 3,042 ft., Aux Vases 3,112 ft., Ste. Genevieve 3,157 ft., Rosiclare 3,175 ft., Fredonia 3,198 ft., McClosky 3,217 ft.,

McBride 1 Youngblood, SW SE 19-1s-5e, pumped 221 bbl., 25-qt. shot 2,873-90 ft., Aux Vases 2,868-78 ft., T.D. 2,893 ft.

Dee Bros. et al 1 Fuhrer, SW SE 18-1s-7e, dry at 3,329 ft., Menard 2,445 ft., Glen Dean 2,650 ft., Golconda 2,740 ft., Barlow 2,850 ft., Weiler 2,862 ft., Paint Creek 3,108 ft., Renault 3,135 ft., Aux Vases sand 3,145 ft., Ste. Genevieve 3,216 ft., McClosky 3,269 ft.

Mabee O. & G. 1 P. C. Borah, W½ NW NW 22-1s-9e, dry at 3,488 ft., Menard 2,468 ft., Waltersburg 2,507 ft., Vienna 2,606 ft., Glen Dean 2,696 ft., Hardinsburg 2,745 ft., Golconda 2,826 ft., Barlow 2,938 ft., Weiler 2,954 ft., Bethel 3,135 ft., Renault 3,183 ft., Aux Vases sand 3,255 ft., McClosky 3,333 ft., St. Louis 3,403 ft.

White County: H. K. Riddle et al 1 Myers, NW SE SW 12-6s-10e, dry at 2,110 ft., Kincaid 1,857 ft.

#### Fields

Bible Grove, Clay County: Pure 1 A. H. Kluthe, NW NW SE 4-5n-7e, pumped 324 bbl., natural, Cypress sand 2,495 ft., pay 2,506-19 ft., T.D. 2,519 ft.

Texas C. Nodler, NW NW SW 4-5n-7e, dry at 2,868 ft., Glen Dean 2,318 ft., Hardinsburg 2,340 ft., Golconda 2,379 ft., Barlow 2,472 ft., Weiler 2,491 ft., Paint Creek 2,605 ft., Benoist 2,654 ft., Renault 2,700 ft., Aux Vases 2,727 ft., Ste. Genevieve 2,800 ft., Fredonia 2,820 ft.

Texas 3 W. Landwehr, NW NE NW 9-5n-7e, pumped 228 bbl., 15-qt. shot 2,482-97 ft., Cypress 2,475 ft., T.D. 2,498 ft.

Bluford, Jefferson County: Ohio 1 J. Lingle, N½ SE SW 36-2s-4e, pumped 515 bbl., 5,000 gal. acid, McClosky 3,064-73 ft., T.D. 3,087 ft.

Bone Gap, Edwards County: Tide Water 1 St. Ledger, SE SW 18-1s-11e, pumped 6 bbl. oil and 14 bbl. water, 4,500 gal. acid, McClosky 3,167-72 ft., T.D. 3,265 ft., P.B. 3,185 ft.

Boulder, Clinton County: Texas 9 P. Gray, SW NE SE 35-3n-2w, salt water disposal well, T.D. 827 ft.

Covington, Wayne County: Pure 3-A Cravens, SW SE 25-1s-6e, pumped 220 bbl. oil and 41 bbl. water, 5,000 gal. acid, McClosky 3,234-38 ft., T.D. 3,265 ft.

Sohio 1 Hanna Louder, NE NE 36-1s-6e, pumped 115 bbl., 5,000 gal. acid, McClosky 3,234 ft., T.D. 3,256 ft.

V. A. Thompson 1 Whitlock, W½ SW NW 9-1s-7e, pumped 100 bbl., 20-qt. shot 3,133-41 ft., Aux Vases 3,130-48 ft., T.D. 3,320 ft., P.B. 3,123 ft.

Dale, Hamilton County: Pure 1 Mitchell Consol., SE SW

*(Continued on Page 244)*

## MICHIGAN OPERATIONS

# New Fields Opened in Mecosta And Missaukee Counties

By OTTO C. PRESSPRICH

SAGINAW, Mich.—Improvement in Michigan's oil prospects continued last week with interest centered on another wildcat strike—this one in Aetna Township, Missaukee County, hard on the heels of the first production in Mecosta County, a gusher that, pinched in, produced more than 500 bbl. of oil in 24 hours.

Twelve miles north of the Winterfield-Clare pool, the newest strike, drilled by Gordon Oil Co. on its Blue lease in Section 26 of Aetna Township, was reported making around 50 bbl. a day with the company planning to put the hole on pump before acid treatment. Dry holes have been drilled previously to the south and west but oil men said the area is ample for a potential major field in which a dozen companies hold acreage rights.

The Sun Oil Co. Mecosta County strike in Fork Township rang the bell for a flurry of new drilling operations. Sun, Smith Petroleum and Gulf Refining companies have announced plans to start new tests at once. Simrall Corp. of Mount Pleasant is setting up transportation facilities for the 1 Murray, located in Section 5, and drilled to 3,818 ft.

Following up the Chartiers Oil Co. 1 Church wildcat, first commercial producer in Gratiot County, Rex Oil & Gas Co. has staked location for a test in Section 30 of Pine River Township. The Church, in Section 31, is making around 30 bbl. a day steadily.

Pure Oil Co. reported production increased in its Winterfield-Clare deep test, the 1 McClain, after acid treatment. The first big deep test producer in the area at better than 250 bbl. a day, the hole was drilled to 5,100 ft., plugged back to 5,060 ft.

On a state-wide basis last week Michigan oil operations resulted in 19 completions, nine for oil production with total initial potential of more than 1,250 bbl. a day. Producers included two new Gulf Refining wells in Bay County, another well in Arenac County, two in Clare, others in Lake, Osceola and Roscommon.

Dry holes were preponderently wildcat tests, including two in Muskegon County, where the Michigan oil industry began. Taggart Brothers Co. added two small gas wells in Missaukee County and one location was abandoned.

August production figures in Michigan, reported by the Michigan Oil and Gas Association, showed

*(Continued on Page 236)*

# Playa del Ray Gas Storage Project Getting Under Way

By L. P. STOCKMAN

LOS ANGELES, Calif. — The proposal to store natural gas in the Playa del Rey field of Los Angeles Basin, sponsored by Richard Sachse of the state Railroad Commission and Roy A. Wehe, gas and electrical engineer for the commission, is rapidly taking shape and will become a reality within another 30 days. The purpose of this project is to store surplus natural gas in the Playa del Rey field during the summer season when gas consumption is low, and to withdraw it during the peak demand period during the winter. It has been recognized for more than a year that southern California faced a possible gas shortage if a cold spell set in and lasted for any great length of time. About a year ago the Pacific Lighting Co. purchased all acreage comprising the Goleta gas field in Santa Barbara County and has been storing natural gas in this reservoir all during the past summer. It will be produced again during the forthcoming winter season. This injection and withdrawing of gas permits operating companies to closely balance supply and demand during cold periods. It has been recognized for some time, however, that it would be advisable to store natural gas nearer Los Angeles Basin, as this would make it more readily available and eliminate a 90-mile haul and at the same time remove any possibility of interrupted service as a result of a bombing attack or heavy rains that might wash out transmission lines.

Southern California Gas Co. has been designated as the agency to store natural gas at Playa del Rey and the surplus gas to be stored will be moved into the area from San Joaquin Valley fields, coastal district fields and from producing areas in southern California. Under arrangements already completed, the Playa del Rey field will be taken over by the Defense Plant Corp. for use as a storage center. The Defense Plant Corp. is not losing any time in putting the plan into operation and hopes to have gas actually being injected within 30 days. Pipe-line connections are being made to permit gas injection by the Southern California Gas Co. and the necessary compressors will be in position within another several days. Completion of this project should remove any possible shortage of natural gas, but it might not be entirely satisfactory during next winter due to the short time allowed for gas injection. The project will be operated by the Defense Plant Corp. and this agency will designate certain functions to operating agencies. Obviously it will mean that production activities in the Playa del Rey field will not be possible during periods of gas injection, but it is believed that gas storage will reduce lifting costs and increase ultimate recovery of the field from a crude-oil standpoint. The Playa del Rey field contains two zones designated as the Recreation and Del Rey zones and either or both may be employed for storage, depending upon what is found by actual operating conditions. The zones are fairly loose and porosity, while not as favorable as might be desired, is sufficient to permit gas storage.

The Playa del Rey field has been in a depleted condition for several years, and all wells have been reduced to the pumping stage. The productive measures are not any too thick, and for this reason the field has only produced 49,000,000 bbl. of crude oil up to the present time. The field was discovered by Ohio Oil Co. in December 1929, and the lower or Recreation zone was discovered first. Union Oil Co. was the first company to develop commercial production in the upper or Del Rey zone, completing its first well in July 1930. The Playa Del project will (1) provide an underground storage basin for natural gas with a capacity of from 20 to 30 times the total above-ground storage space in southern California; (2) store a reserve supply of natural gas which will insure the supplementary amount necessary to supply the demand on 100 cold peak days; (3) greatly relieve the mounting problem of providing natural gas for southern California because of tremendous increases in war production with its accompanying population growth, and (4) end the waste of large quantities of gas by the blowing of gas into the air. In past years this waste has occurred in many oil fields where no provisions were available for storing surplus gas. Conversion of the Stanpac gas line to crude oil will make greater amounts of natural gas from San Joaquin Valley fields available to the southern California market, which includes San Diego and other adjacent towns in the south. To move a larger amount of natural gas from the San Joaquin Valley to southern California it will be necessary for Southern California Gas Co. to keep its transmission facilities operating at maximum capacity as some of this gas will go into storage at Playa del Rey to permit the diversion of some other gas for injection.

## Second Well Started in New Suisun Gas Field

Standard Oil Co. is still working on 2-1 Suisun Community, a potential discovery well in a new gas field at the extreme eastern end of Suisun Bay, which is located east of San Francisco and San Pablo Bay, but is handling the well very carefully in order to prevent it from getting beyond control. This wildcat, which has shown enough to justify the expectation of a gas discovery on the Suisun lease, began flowing gas around the casing several weeks ago and then started erupting around the derrick, which is located on a reinforced foundation to provide a base in the marshy ground. Cement was pumped in but failed to hold and to date about 17 cement jobs have been undertaken. The latest job appears to be holding in good shape, but in the meantime Standard is building roads to a second well to be drilled northwest of the original well. Standard's 2-1 Suisun Community is located in 25-3n-1w, and the new well will be drilled on the Fontana property in 23-3n-1w. Tide Water Associated Oil Co. has abandoned 1-8 Woodland Community in Yolo County as a duster at 3,587 ft., but this will be offset by a new gas test to be drilled at Tuscan Springs by Texas Co. and 1-A Willard of Ohio Oil Co. which will be drilled in the Willows area in 18-20n-2w. Ohio Oil Co. is believed to have a good gas field at Willows, but it has not yet been on sustained production long enough to definitely determine its status. Texas Co. is making good progress in 2 Holmes-Eureka in the Tompkins Hill gas field, which it discovered in 1937, but which has only produced a limited amount of gas during the past year. This new gas test should reach the pay within the next 3 weeks unless mechanical trouble develops at the last minute.

## Starting New Wells in Old Kern River Field

Tide Water Associated Oil Co. has been granted exceptions for the drilling of six new wells in the old Kern River field and locations have been staked for three new wells to be drilled at once. These new locations are for 11 Chicago Crude in 30-28s-28e and 72 and 73 Reed Crude in 32-28s-28e. Present plans call for immediate drilling, but no final decision has been reached with respect to the proposal to carry 72 Reed down for a deep test. If such deep test is made it should definitely determine the possibility of developing lower production in the Kern River field as all tests to date have shown a variation in subsurface formations. The Kern River field produces a heavy crude oil that is in much demand for fuel oil. Tide Water Associated Oil Co. and Standard Oil Co. are both at work reducing the water table in this field by using large turbine pumps, and this work is meeting with marked success. The water height in wells that stood around 700 ft. a year or two ago has now been substantially lowered and an improvement should be noted within another several months after the large pumps have been in operation a little longer. The Kern River field is a water drive field and it is therefore necessary to pump large volumes of water in order to develop commercial production of crude oil. This field has been standing shut in for a number of years, and consequently water has had a good chance to flood many properties. It will take another year or so to get ahead of the water but Tide Water's pioneering with large turbine pumps has induced Standard to follow a similar procedure.

## Navy to Handle Elk Hills Reserve

Reports from Washington indicate a decision has been reached by the Navy Department to undertake all new work in the Elk Hills field of Kern County itself. This matter has been under consideration for more than a year and the suspension a few months ago of all work by Standard Oil Co. tends to confirm the report that the Navy Department will do all its future work. Secretary Ickes has transmitted a draft of a bill to Congress which would terminate at the expiration of their current terms all existing oil and gas leases of public lands within the known geologic structure of Elk Hills, but outside the limits of Naval Petroleum Reserve 1. This is of primary importance because the Elk Hills field and the Tupman field, located to the east, now appear to be almost contiguous and development work during the past year has indicated the possibility that the Elk Hills field extends beyond the original boundary of Naval Petroleum Reserve 1. Standard Oil Co. has been drilling a number of wells for the Navy Department in this field as well as drilling several test wells and outposts for its own account during the past year or so. Standard Oil Co. is not doing this work in order to develop additional production, but started drilling after a long period of dormancy in order to determine property values. This work has been done with the approval of the Navy Department as the Navy desires to take full and complete control of the entire field and must condemn some privately owned land. As a result of this work the productive limits of the Elk Hills field have been substantially increased and in addition Standard proved up the existence of Stevens zone production. Until Standard undertook this work no Miocene production had been developed at Elk Hills as two previous deep tests had failed to result in lower production. The Elk Hills field now contains probably the largest

crude oil and gas reserve in California, although it is not fully developed. The Navy Department has indicated it desires complete control of the field for use at some future time in order to protect public interest and guarantee an adequate supply of oil.

### Kettleman Recompletion Makes Good Flow

Tide Water Associated Oil Co. got a pleasant surprise in the Kettleman North Dome field early in the week when it recompleted 1 Whepley flowing 1,773 bbl. of clean 33.2-gravity oil and 2,200,000 cu. ft. of gas per day from 9,066 ft. This well, which was completed shortly after discovery of the Kettleman North Dome field back in 1928, has been producing for over 10 years. Tide Water Associated decided a short time ago to deepen the hole to ascertain if current production could not be stepped up. The hole was accordingly deepened from 7,904 ft. and finished in the sixth Temblor zone of Miocene age. This lease is one of the properties that could not be brought into the Kettleman North Dome Association which was organized to unify drilling and production activities as far as possible. The Whepley and Felix properties on the north flank of the structure and the Huffman and King properties at the extreme western end of the structure did not join the unit plan due principally to objections on the part of the landowners involved. There is very little incompleted drilling under way in the Kettleman North Dome field at the present time as Kenda, Standard and R. S. Lytle are winding up drilling for an indefinite period.

#### SAN JOAQUIN VALLEY COMPLETIONS

Kettleman North Dome, Kings County: Tide Water Associated Oil Co. 1 Whepley, 35-21s-17e, flowed 1,773 bbl., 33.2-gravity, 1.8 per cent cut, 2,200,000 cu. ft. gas, 128/64-in. bean, pressures 380/880 lb., T.D. 9,066 ft., perf. 8,901-9,066 ft., recompleted in sixth Temblor zone of Miocene age, 8,910-9,066 ft., after being deepened from 7,904 ft.

McKittrick, Kern County: Westates Petroleum Corp., 3 Kimble, 32-29s-22e, dry, T.D. 1,670 ft.

Westates Petroleum Corp. 4 Kimble, 32-29s-22e, dry, T.D. 1,769 ft., tar sand 1,630-34 ft., 1,646-50 ft., bottomed in gray shale.

Midway-Sunset, Kern County: Chanslor-Canfield Midway Oil Co. 24-1 fee, 1-32s-22e, dry, T.D. 3,946 ft.

Terra Bella wildcat district, Tulare County: V. P. Arnold 1 Terra Bella, 5-23s-28e, dry, T.D. 255 ft.

Tulare wildcat district, Tulare County: G. W. Stout 2 Tulare, 35-22s-27e, dry, T.D. 1,010 ft.

Tupman, Kern County: Richfield Oil Corp. 61-34 Kern County Land, 34-30s-25e, flowed 2,009 bbl., 33.2-gravity, 0.1 per cent cut, 2,400,000 cu. ft. gas, two 128/64-in. beans, pressures 200/100 lb., T.D. 9,328 ft., no liner used, completed in first and second Stevens zone of Miocene age.

Wheeler Ridge wildcat district, Kern County: Kern Line Petroleum Co. 1 Wheeler Ridge, 10-11n-19e, dry, T.D. 8,390 ft.

### Preparing to Test Newhall Potrero Outpost

Texas Co. has cored some oil sand in its Newhall wildcat in 22-4n-17w at 7,842 ft., and preparations are under way to clean out the hole and make a formation test. This oil sand looks quite good and if it results in commercial production Texas Co. will have extended the productive limits of the Newhall Potrero field or proved up a new accumulation. This wildcat, 1 Newhall, is located about 1,750 ft. northwest of nearest production developed by Barnsdall Oil Co. in the Newhall Potrero field. When Barnsdall Oil Co. discovered the Newhall Potrero field it appeared the company would find the amount of productive acreage rather limited in extent, but when C. G. Willis and associates moved 1 mile to the southeast and completed 1 Ferguson as a flowing well the limits of the field were almost doubled. Now if Texas Co. extends the productive limits of the Newhall Potrero field 1,750 ft. to the northwest Barnsdall will have another 80 acres or so added to its present productive property. In the southeastern end of the Rancho San Francisco lease in the Newhall Potrero field, Barnsdall is making good progress with well No. 32 on this property and should reach the pay within the next few weeks. This well is a westerly offset of Willis 1 Ferguson, which extended the southeastern limits of the field several months ago.

R. E. Havenstrite has not yet proceeded with a formation test of the new deep zone found in the Del Valle field of Los Angeles County at 7,975 ft., but may do so in the immediate future. To date this operator has been testing out two zones that were missed during drilling operations but which showed up on electric log. A formation test of one of these intervals at 6,920-7,237 ft., open 1 hour and 20 minutes, resulted in a recovery of 6,600 ft. of gas-cut mud showing about 10 per cent oil which tested 40-gravity and no water. The recently discovered deeper zone appears very gassy and for this reason it will either have a lot of kick or prove to be a gas sand. This zone will have considerable effect on future production of the Del Valle field which has not looked any too hot in the present Modelo sands of Miocene age. West of this area, in the San Martinez field, Standard Oil Co. and Ohio Oil Co. are drilling ahead in their respective wells that are headed down to the recently discovered oil sand of Pliocene age. This new zone was found by Standard Oil Co. a short time ago in 3 Sepulveda and looks very good on the basis of one well. The extent and future importance of this new Pliocene zone from a production standpoint remains to be determined, but since the zone was found in the east end of the San Martinez field it may

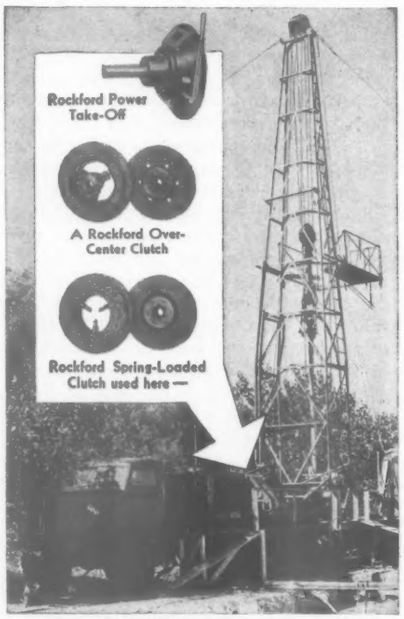
(Continued on Page 242)


# Rockford Clutches

## ...Naturally, In Fine Equipment

A Rockford Spring-Loaded Clutch controls power delivery from the Diesel drilling engine in the Franks Portable Rig illustrated. Extensive use of Rockford Clutches and Power Take-Offs in fine oil field equipment is the logical result of the many advantages they offer for designing, manufacturing, machine operation.

Rockford Clutches are compact . . . plenty tough, smooth-working, capable of continuous reliable performance under all operating conditions. Our various Over-Center and Spring-Loaded Clutches, in many standard sizes, provide correct types and capacities for indicated applications in tractors, power units, and specialized producing or servicing equipment. The Power Take-Offs fit S.A.E. housings, take any suitable clutch. Whether you buy or build equipment, specify "Clutch: Rockford . . ." for unexcelled operating satisfaction and economy.




ROCKFORD DRILLING MACHINE DIVISION BORG-WARNER CORPORATION

1305 Eighteenth Avenue, Rockford, Illinois, U. S. A.

Over-Center Clutches • Spring-Loaded Clutches • Power Take-Offs

# AN IMPORTANT SERVICE IN THE NATIONAL WAR EFFORT

**We conserve metals difficult to replace. We have solved the condensate corrosion problem in steam systems. In the Cook County Nurses' Home in Chicago, where extra heavy wrought iron piping withstood corrosive condensate only thirty days, Haering Glucosates corrected the condition, and test pieces six months later were free from corrosion deposits. We protect metals in boilers, piping, condensers and heat exchangers, too.**

The Glucosates also conserve energy. Less fuel is needed —more production obtained—where Glucosates control scale, corrosion and living organisms. The Glucosates save raw materials too. Less chemicals are used where Glucosates substitute for common inorganic materials.

Write today for free booklets of complete story. We will send sample containers and data forms to enable you to give us an accurate picture of your water problems.

*Visit the "Chamber of Scale and Corrosion Horrors" in our booth No. 50 at the National Chemical Exposition, Hotel Sherman, Chicago, November 24-29, 1942.*

WE RID YOU OF THIS HAVOC QUARTET
CORROSION
1
Works havoc in your pipes, boilers and heat exchangers
BACTERIAL DEPOSIT
2
Makes itself at home and plugs up your pipes and tubes
HOT WATER SCALE
3
Fights hard to keep you from getting water necessary for production
OILY BOILER DEPOSIT
4
Eats up power and bags your tubes

D. W. HAERING & CO., INC.

GENERAL OFFICES 205 West Wacker Drive CHICAGO ILL.

WE READ WATER

# Drilling Under Way at Test West of Marathon Field

By CARL HOOT

ROSS U. PORTER, oil operator of Shawnee, has begun drilling below surface pipe at his 1 Harsh, NW NE NE 22-22n-2e, a wildcat 2 miles southeast of the new Liberty pool, and the same distance west of the old Marathon pool, both in Noble County. No. 1 Harsh will be drilled to the Wilcox and is located on a prominent surface feature which has been widely discussed by Oklahoma geologists for several years. The area has been intensively seismographed by major companies holding acreage offsetting the 1,600-acre block assembled by Porter.

Alma Oil Co. has completed another good producer in the East Watchorn pool of Pawnee County, an April discovery, at its 1 Brown et al, SW NW NE 26-23n-3e. No. 1 Brown encountered the Wilcox at 3,961-85 ft. and flowed 460 bbl. of oil in 24 hours through casing. Tubing was run and production set at 300 bbl. daily, which is the allowable.

In the same area, Alma 1 Traver, SW NW SW 25-23n-3e, was drilling below 3,500 ft. and the 1 Grant, SW NE 26-23n-3e, was below 2,100 ft.

### Guthrie Outpost Staked

Continental Oil Co. will attempt to extend the Guthrie pool of Logan County to the northwest at its 2 Metzger, NE SW NE 12-17n-2w, which was spudded last week. Location of the test is 40 acres due north of the Sunray Oil 3-A McLeod, which was recently completed for 100 bbl. daily to extend the play 40 acres due west. These wells are in the Bartlesville zone.

Meanwhile, however, extension to the south has apparently failed. The Sunray Oil Co. et al 1 Holland, NE SW SW 8-17n-1w, drilled to 5,509 ft. to the white Wilcox and is shut down for orders.

W. A. Delaney is drilling ahead to the Bromide zone in an attempt to extend the Jesse field on the Coal-Pontotoc County line at his 1 Gipson, SW SE NE 7-1n-8e, on the Coal County side of the field. The well is ½ mile east of production (gas at 2,145 and 4,012 ft.) and topped the Wapanucka at 2,245 ft. and had a show of oil in the Hunton lime at 3,716-22 ft. At latest reports it was drilling at 3,990 ft. in the lower section of the Hunton.

#### OKLAHOMA COMPLETIONS

**Wildcats**

Comanche County: Texas 1 Roll, SE SW 5-3n-10w, 4,000,000 cu. ft. gas, 1,000 gal. acid to clean walls, pay 886-977 ft., T.D. 8,087 ft., P.B. 977 ft., *discovery.*

Hughes County: R. O. Bailey (Carolyn Oil) 1 Williams, SW SW NE 14-9n-10e, pumped 47 bbl. oil and 25 bbl. water, 60-qt. shot 3,928-51 ft., Wilcox 3,928-41 ft., T.D. 3,962 ft., *discovery.*

Jackson County: Rinehart-Donovan 1 H. Petzold, SE SE NE 20-3n-20w, temporarily abandoned at 4,022 ft., reported in Simpson at T.D.

McIntosh County: B. H. Young and J. H. Rebold 1 McIntosh, NW SW 4-12n-17e, dry at 2,082 ft., sand 138 ft., 772 ft., 1,398 ft., 2,059 ft.

Marshall County: H. F. Potts et al 1 Neff-Godfrey, NE NE SW 13-6s-6e, pumped 105 bbl., 10-qt. shot 3,102-09 ft., 5,000 gal. acid, reacidized 7,000 gal., pay 3,100-3,230 ft., T.D. 3,690 ft., P.B. 3,264 ft., *discovery.*

Osage County: Mohican 1 Osage, NW NE NE 9-24n-6e, dry at 2,922 ft., Burbank 2,796 ft., Mississippian chat 2,841 ft.

Pontotoc County: Blackwell 1 Gilmore, NW SE SW 4-3n-5e, dry at 1,060 ft., Clavin 790 ft.

Berry & Johnson O. & R. 1 School Land, NE SW SW 16-3n-5e, dry at 5,013 ft., Hogshooter 2,390 ft., Bartlesville 4,085 ft., Hunton 4,767 ft., Viola 4,898 ft., Wilcox 4,936 ft.

Pottawatomie County: J. F. Smith et al 1 Beal, NW SE SW 33-8n-4e, dry at 4,491 ft., Hunton 3,860 ft., Viola 4,190 ft., Wilcox 4,485 ft.

Stonewall 1 Coleman, SW NW 22-8n-4e, dry at 64 ft.

Herndon et al 1 Jarvis, NW SW NE 6-8n-4e, dry at 5,135 ft., Hunton 4,525 ft., Viola 4,820 ft., Wilcox 5,020 ft., second Wilcox 5,100 ft.

Hall & Graham 1 Woods, SW NW SW 32-7n-4e, location abandoned.

Seminole County: McIntyre et al 1 Osborne, NE NE SE 11-6n-6e, pumped 24 bbl. oil and 12 bbl. water, perf. 2,725-27 ft., 40-qt. shot 2,727-33 ft., pay 2,725-33 ft., T.D. 4,105 ft., *discovery.*

**Fields**

Apache, Caddo County: Texas 3 N. B. Smith, NE NW NE 3-5n-12w, flowed 302 bbl. in 2 hr., sand zone 3,733 ft., pay 3,751-3,940 ft., T.D. 3,940 ft.

Avant, Osage County: J. E. Cooper 4, NW NW NE 25-23n-11e, pumped 4 bbl., 120-qt. shot 1,665-1,708 ft., Bartlesville 1,600-1,710 ft., sand 1,740-53 ft., T.D. 1,753 ft.

Crescent, Logan County: Continental et al 2 Smith, SW SW NE 34-17n-4w, flowed 63 bbl., natural, Layton 4,916 ft., pay 4,916-33 ft., T.D. 4,933 ft.

Continental et al 4 Ferguson, SW SE SE 27-17n-4w, flowed 465 bbl., Layton 4,938 ft., pay 4,938-60 ft., T.D. 4,960 ft.

Glenn Pool, Creek County: Gulf 41 Berryhill, NW NE NE 17-17n-12w, pumped 25 bbl. oil and 17 bbl. water, 260-qt. shot 1,555-1,645 ft., sand 1,486-1,647 ft., T.D. 1,651 ft.

Hallett, Pawnee County: Mid-Continent 24 School Land, NW NE SE 16-20n-7e, pumped 8 bbl., 15-qt. shot 2,899-2,907 ft., chert 2,891 ft., T.D. 2,918 ft.

Hobart, Kiowa County: Sherman et al 1 Watkins, SW SW NW 20-7n-17w, pumped 85 bbl. oil and 40 bbl. water, T.D. 1,201 ft.

*(Continued on Page 231)*

FOR DRILLING

and other Oil Field Operations

*Use Natural Gas*

FOR DRILLING . . . Natural Gas presents no fuel storage problem. It is always ready and its ease of handling promotes maximum efficiency at the rig.

FOR REPRESSURING AND LEASE OPERATIONS . . . Natural Gas is economical and dependable.

We will welcome an opportunity to serve you in your drilling or other oil field operations in the Gulf South. A phone call or letter to any of our offices* or employes will receive prompt attention.

*TEXAS: Beaumont, Beeville, Dallas, Fort Worth, Houston, Longview, San Antonio and Wichita Falls. LOUISIANA: Baton Rouge, Iowa, Monroe and Shreveport. MISSISSIPPI, ALABAMA and FLORIDA: Jackson, Mississippi.

*UNITED GAS PIPE LINE COMPANY*

DEPENDABLE NATURAL GAS SERVICE DOESN'T JUST HAPPEN

## TEXAS GULF COAST

# Two Wildcats on Wilcox Trend Log Encouraging Showings

By F. L. SINGLETON

HOUSTON, Tex.—Main interest along the Texas Gulf Coast district was centered on the Wilcox trend where encouraging showings were logged in two wildcats in Austin and Montgomery counties. In addition several other tests along the trend had reached critical stages and the outcome is expected to be determined within the next few days.

Three miles southeast of Orange Hill, Austin County, Ohio 1 First National Bank made its appearance as a pool opener with the recovery of gas and distillate on two drill-stem tests. The first test was made at 9,084-9,137 ft., and recovered 450 ft. of gas-cut mud with a distillate taste and tested 450-lb. working pressure in 20 minutes, while a 19-minute test at 9,143-64 ft. recovered gas-cut mud and some salt water. The well was shut down at the close of the week at 9,274 ft. preparatory to running an electrical log. Location is in the V. Flores Survey.

La Gloria Corp. 1 Grogan-Cochran Co., 3 miles southeast of the town of Magnolia, Montgomery County, is bottomed at 10,358 ft. and 7-in. casing was cemented at 10,355 ft. following the running of an electrical log. Details as to what showings were logged were not available and the cementing of the 7-in. casing indicates that the hole may be drilled deeper before a test is made. The well is located southwest of the Lake Creek field on a block that was originally assembled by Grey & Wolfe.

In the same county, and located about 3 miles northeast of the Lake Creek field, Superior 1 E. G. Frost, reported last week as flowing oil and brackish water, has been killed and tubing is being pulled preparatory to plugging back to 10,225 ft. On a recent gage, the well flowed 230 bbl. of fluid per day through a 20/64-in. choke and 41.3 per cent of the fluid was brackish water. The well is believed to have produced from casing perforations at 9,985-10,004 ft. which were not squeezed off when the well was tested at 11,508-33 gt. Due to the multiplicity of sands in the field proper, several of which have not been tested, it is possible that this well is located on the same structure although this will not be revealed until additional development is done.

West of the Mercy field, San Jacinto County, Fain Drilling Co. 1 Hattie Baldwin, located in the S. Arnold Survey, is drilling in shale below 8,288 ft. The Eponides Yeguaensis was topped at 5,548 ft. and the Ceratabulimina at 6,596 ft. The well is believed to be in the Wilcox, although the top of the section was not available. In the meantime, the southeast limits of the Mercy field were defined with the abandonment of Atlantic 1 Beschell which was quit at a total depth of 8,317 ft. after several attempts to complete in the regular pay failed. Shell Oil Co., Inc., expanded its operations with the staking of three new locations, all being located on the west side of the field.

North of the town of Edna, Jackson County, Texas Co. was preparing to test 1 O. D. Collier located in the J. Kerr Survey. With the hole bottomed at 3,730 ft., 7-in. casing was cemented at 2,598 ft., and the test is expected to be made at 2,482-88 ft., where drill-stem testing recovered oil and some salt water, and at 2,495-97 ft., and 2,503-8 ft., where sand with an oil odor was logged. The sand is believed to be the Catahoula and corresponds with the Cordelle field pay.

In Trinity County, Magnolia Petroleum Co. is moving in material for 1-C Cameron, a projected 7,500-ft. Wilcox test. The well is 1-G Cameron Lumber Co., located in Block 85, J. A. Sepulveda Survey. This is the third Wilcox test to be drilled by the company in this area. Two previous tests were abandoned although sufficient showings were logged in the Wilcox to cement casing for testing.

### TEXAS GULF COAST COMPLETIONS

**Wildcats**

Fort Bend County: Harvey Schmidt 1 Fields, dry, T.D. 1,063 ft.

Harris County: George W. Strake 1 Florence & Parker, dry, T.D. 8,005 ft.

Jackson County: Rowan & Hope 1 H. B. Glass, dry, T.D. 5,502 ft.

**Fields**

Dyersdale, Harris County: Frank Gravis 1 G. W. Burkett, 103 bbl. gas lift, perf. 4,060-67 ft., T.D. 4,080 ft.

Harmon, Jackson County: Gulfboard 1 Mauritz & Meyer, 129 bbl., 5/32-in. choke, perf. 5,344-58 ft., T.D. 5,500 ft.

Katy, Waller County: Houston 1 John Cope, 90,000,000 cu. ft. gas open flow, perf. 7,178-7,304 ft., T.D. 7,502 ft.

(Continued on Page 244)

NO-OX-ID and NO-OX-IDized Wrapper being applied with traveling type coating and wrapping machine to protect lines in highly corrosive soil and under water.
Gas holders of the lift type are completely protected, either by brush application of NO-OX-ID "A" Special X" or NO-OX-ID Water Seal in cups to coat the lifts by submersion.
Pipe lines are completely protected against moisture penetration and other corrosion accelerators with a combination NO-OX-ID and NO-OX-IDized Wrapper
Oil tanker lines are maintained in perfect condition with NO-OX-ID, even when subjected to the encrustation of salt spray and dirt.
From Production Line to Front Line . . .
On Battlefields or Oilfields, RUST MUST BE CONQUERED!
On battlefields, rust must be conquered before the battle breaks! In fact, this job has to be done at home . . . when repair parts are prepared for shipment. In this process, NO-OX-ID conquers rust regardless of circumstances, even such adverse ones as related in our advertisement in Newsweek, reproduced above.
In the oilfields, it's different! For over twenty-five years NO-OX-ID has been the well-known rust preventive for protection of pipe lines, tanks, structures, and machinery. Here practically everyone knows that NO-OX-ID conquers rust two ways: mechanically by excluding moisture and oxygen and chemically by inhibiting any underfilm corrosion which may be present. There is a combination of NO-OX-ID and NO-OX-IDized Wrappers for every rust-conquering job you have. Write us. Dearborn Chemical Company, Dept. K, 310 S. Michigan Ave., Chicago, Ill.
NO-OX-ID IRON-OX RUST
TRADE MARK
the original rust preventive

# Preparations Underway to Test Well in Bayou Couba Area

By F. L. SINGLETON

NEW ORLEANS, La. — In the Bayou Couba area, St. Charles Parish, Gulf Refining Co. was preparing to test 1 Delta Securities Co., which has apparently assured the Louisiana Gulf Coast district of another new oil field. After topping salt formation the previous week at 6,892 ft. and drilling to a total depth of 6,917 ft., 5½-ing casing was cemented at 6,912 ft. and the first test is expected to be made at intervals from 6,512-60 ft. Should the well fail to produce from this horizon, other sand and sandy shale sections which showed possible production are scheduled to be tested at intervals from approximately 2,200-6,500 ft. That a new field has been uncovered is indicated by the fact that the company has staked locations for two additional wells, these being 4 Delta Securities, a projected 7,000-ft. test which will be drilled as an offset to the present well, and 5 Delta Securities, a projected 11,000-ft. test located about 1 mile northeast in 7-15s-22e. This structure is situated about 14 miles northwest of New Orleans and due east of the Bayou Des Allemands field.

Humble Oil & Refining Co. marked up a 4,000-ft.-east extension to the Bayou Sale field, St. Mary Parish, with the completion of 1-E Miami Corp. in 43-16s-9e. With the hole bottomed at 11,102 ft., casing was perforated at 10,345-52 ft., and the well flowed at the daily rate of 190 bbl. of .39-gravity oil through a ⅛-in. choke. Tubing pressure was 1,900 lb. Production on this structure was originally opened at approximately 9,900-10,150 ft., but as development moved southward additional sands were opened at 10,300 ft. and 10,700 ft. by the Atlantic Refining Co. Inasmuch as the discovery sand was logged as a gas sand, there is a possibility that the extension producer may be located on the apex of the structure and that the producing limits might extend for a considerable distance in this direction.

### West Gueydan Field Extended

The deep sand recently opened in the West Gueydan field, Vermilion Parish, was extended southward with the completion of Magnolia 5 Ferguson. The sand section was topped at 10,789 ft. and completion was made through casing perforations at 10,792-94 ft. On an initial gage the well flowed 115 bbl. of fluid through a ⅛-in. choke. Twenty-five per cent of the fluid was salt water. This sand was opened earlier in the year by the Pure Oil Co. but development thus far has been disappointing, although drilling has been limited.

### LOUISIANA GULF COAST COMPLETIONS

#### Wildcats

Avoyelles Parish: H. L. Hunt 1 Hines Lumber Co., dry, T.D. 7,311 ft.

St. Mary Parish: Texas 3 State, Cote Blanche dome, dry, T.D. 9,371 ft.

Terrebonne Parish: Humble 1 Continental Land & Fur Co., dry, T.D. 11,343 ft.

#### Fields

Bayou Choctaw, Iberville Parish: Carter 15 Wilbert, 55 bbl. oil plus 12 per cent salt water pumping, perf. casing 3,830-50 ft., T.D. 6,129 ft.

Bayou Sale, St. Mary Parish: Atlantic 6 St. Mary Parish Land Co., 325 bbl., 9/64-in. choke, perf. casing 10,335-65 ft., T.D. 10,420 ft.

Humble 1-E Miami Corp., 190 bbl., ⅛-in. choke, perf. casing 10,345-52 ft., T.D. 11,102 ft.

Neale, Beauregard Parish: Atlantic 1-E Rice Land & Lumber Co., 205 bbl., 10/64-in. choke, perf. casing 10,997-11,017 ft., T.D. 11,732 ft.

Paradis, St. Charles Parish: Texas 6 Sunset Realty Co., 195 bbl., ⅛-in. choke, perf. casing 10,040-55 ft., T.D. 10,490 ft.

Texas 30 Paradis, 205 bbl., ¼-in. choke, top sand 10,388 ft., T.D. 10,404 ft.

Port Barre, St. Landry Parish: Wm. Helis 3 Futral, 149 bbl., 7/64-in. choke, perf. casing 6,551-6,602 ft., T.D. 6,618 ft.

Ville Platte, Evangeline Parish: Continental 1 Opelousas St. Landry, 153 bbl., ⅛-in. choke, perf. casing 10,204-15 ft., T.D. 10,248 ft.

Sweet Lake, Cameron Parish: Pure 2 Miami Corp., dry, T.D. 9,179 ft.

West Gueydan, Vermilion Parish: Magnolia 5 Ferguson, 115 bbl., ⅛-in. choke, perf. casing 10,792-94 ft., T.D. 10,844 ft.

## Oklahoma Fields

*(Continued from Page 229)*

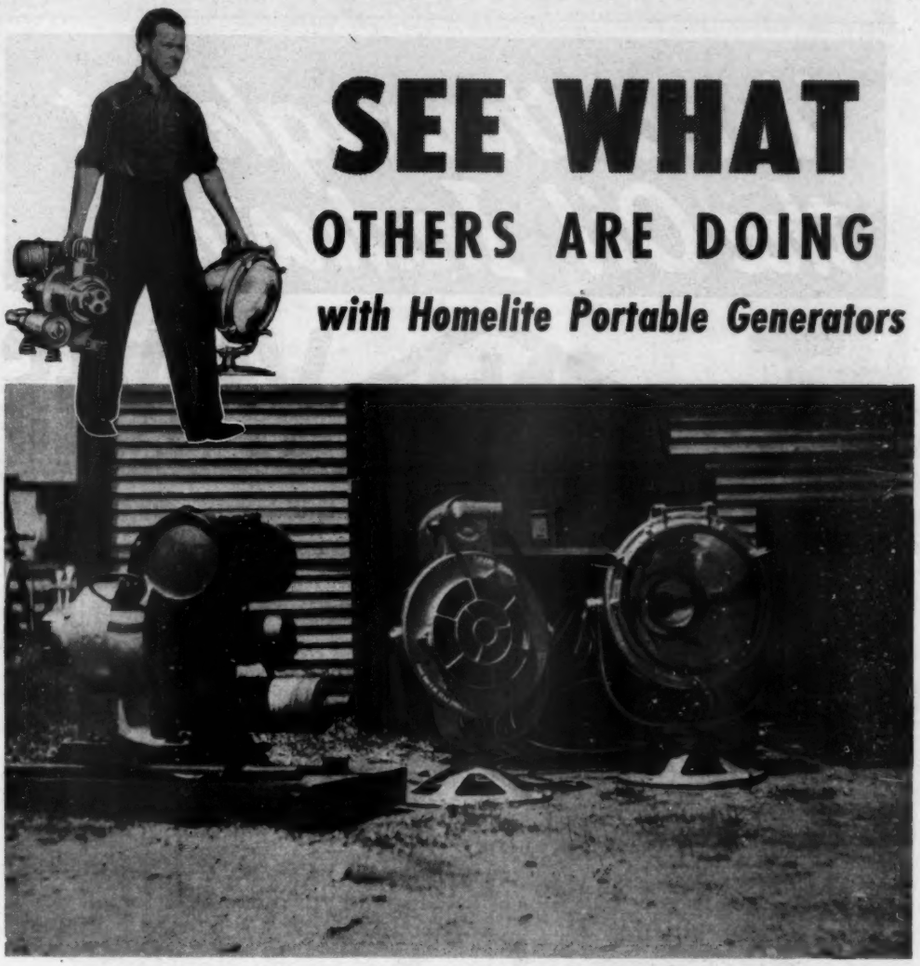
North Bristow, Creek County: Murray Oil 2 Faries, SE SW SE 36-17n-8e, location abandoned.

North Okemah, Okfuskee County: British American et al 1 Bloss, SW SW SW 36-12n-9e, flowed 444 bbl., 60-qt. shot 3,126-50 ft., pay 3,126-50 ft., T.D. 4,105 ft., P.B. 3,160 ft.

#### Miscellaneous

Stephens County: Fair & Bright 1 Peck, NW NE NE 1-3s-6w, 2,190,000 cu. ft., gas, perf. 1,220-40 ft., 532-48 ft., 525-26 ft., pay 525-48 ft., T.D. 1,301 ft.

Fair & Bright 2 Peck, NE NE NE 1-3s-6w, 5,218,000 cu. ft. gas and spray of oil, perf. 1,218-34 ft., pay 1,218-34 ft., T.D. 1,282 ft.

SEE WHAT OTHERS ARE DOING with Homelite Portable Generators

Out in the sticks, where a power line is far beyond reach, oil men are making good use of their Homelite Portable Generators. They take these easily-portable, 83-pound, gasoline-engine-driven generators out with them. And they use them to furnish all the electric power they need to operate floodlights, electric hand tools, radio communications, and electric well-surveying instruments, as well as for emergency standby power in pipeline pumping stations.

With the 1800 watts generated by a Homelite Portable Generator, oil men keep work going right through the night. They speed repair and construction work. They save time and money on every job.

HOMELITE CORPORATION

709 RIVERDALE AVENUE, PORT CHESTER, NEW YORK, U. S. A.

# West Andrews Group of Fields Extended by Three Wells

By ROBERT INGRAM

MIDLAND, Tex. — New wells continued to spread the proven area of the West Andrews group of fields in Southwest Andrews County last week. Three-quarters of a mile northeast of the discovery in the Mascho pool, the Cross & Johnson 1 University, Section 23, Block 10, University Land, has been completed for pumping potential of 132 bbl. of 32-gravity daily, plus 4 per cent water after treatment with 2,000 gal. of acid. Pay had been topped at 4,520 ft. and the well taken to 4,578 ft. for completion. Gas-oil ratio was 643:1.

Three-quarters of a mile northeast of production in the northwestern part of the West Andrews pool, Phillips Petroleum 15 University-Andrews, Section 1, Block 11, University Land, flowed 75 bbl. of oil in 9 hours after 4,000-gal. acid injection. Oil tested 36.1 gravity, with well registering gas-oil ratio of 645:1. First pay had been found at 4,211 ft. and the well was completed at total depth of 4,355 ft.

One and one-half miles southwest of this well and offsetting production, Kewanee Oil & Gas Co. 1 University-Bascom, Section 13, Block 11, University Land, flowed 464 bbl. of 36.7-gravity oil daily, with gas-oil ratio of 583:1. The well had been shot with 660 qt. in pay topped at 4,300 ft. and ranging to 4,435 ft.

Having swabbed only 12 bbl. of accumulated oil after a 12-hr. shutdown, the hole was being washed with 250 gal. of acid this week at the Mid-Continent Petroleum 1 University (South), Section 16, Block 10, University Land, southern Andrews County, wildcat test between the West Andrews and Mascho pools. Previously at total depth of 4,599 ft. the test had been allowed to stand 12 hours and then was swabbed dry through 2-in. tubing set on bottom, recovering 4 bbl. of 32-gravity oil, with no water. The 8⅝-in. casing is set at 4,385 ft. in order that the well can be carried to the Ordovician, but because of short-term lease, operator will make every effort to obtain production at the present level. The deepening will await validation of the lease.

Atlantic Refining 1-A Texu, Section 9, Block 12, University Land, Ordovician wildcat test 13 miles northwest of the Embar area, was drilling below 8,725 ft. in lime and chert.

### Gaines Wildcats Show

Swabbing of 65 bbl. of fluid in 11 hours, with average cut of 5½ per cent basic sediment and 3.8 per cent water, was reported Friday at the Texas Co. 1 J. Bay Robertson, Section 25, Block A-21, P.S.L. Survey, indicating a producer of some kind in southern Gaines County, 2½ miles west of the Kirk area. Operator still was testing with the fluid standing at 1,200 ft. at the start of the 11-hour period, and 450 ft. at the end. The test had been treated with 1,000 gal. of acid through perforated casing from 5,910 ft. to 5,950 ft., averaging two shots per foot.

Shell Oil 1 D. N. Leaverton, Section 458, Block G, C.C.S.D.&R.G.N.G. Survey, Ordovician exploration 4 miles southwest of the Wasson pool in northwestern Gaines, showed gas at 4,878 ft. with slight porosity and stain in samples from 4,880 ft. to 4,888 ft.

The test was cored from 4,883 ft. to 4,895 ft., with 12-ft. recovery. The top 3 in. was dark gray shaly lime, anhydrite and shale, with no shows.

### Two Wildcats in Mitchell County

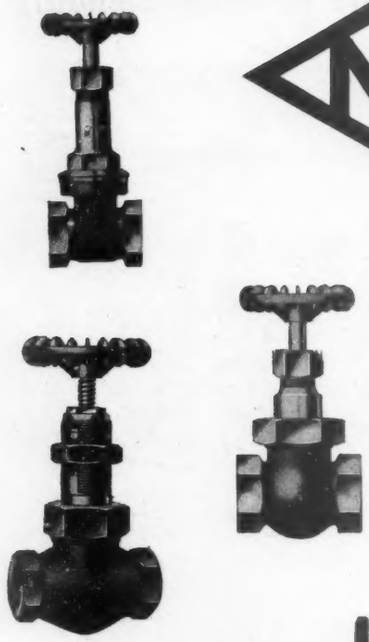
W. D. Casebolt, of Snyder, Tex., has staked locations for two wildcats in Mitchell County, while F. W. Merrick, Inc., had added a producer in the Sharon Ridge pool in the northwestern part of the county. Casebolt 1 Charles J. Thompson will be 660 ft. from the north and east lines of Section 53-25, T.&P. Survey, 2½ miles southwest of Loraine. Casebolt 1 B. D. Smith will be 660 ft. from the north and east lines of the SW 64-25, T.&P. Survey, 6 miles southwest of Loraine.

Both tests are due to be started at once, to be drilled with cable tools 4,000 ft. unless production is obtained at a lesser depth.

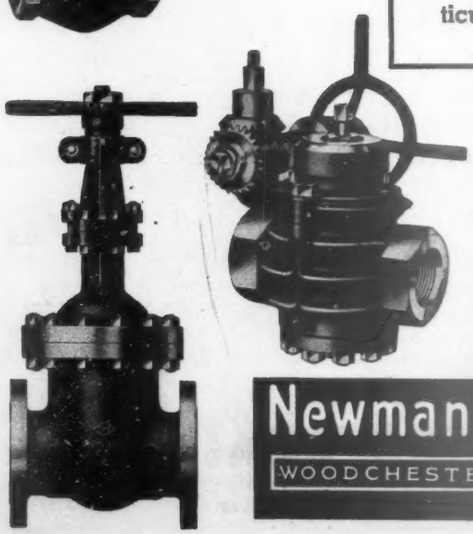
Merrick 4-A E. T. Strain, in the Sharon Ridge pool, registered a daily pumping potential of 99.36 bbl. of 30-gravity oil for completion at 1,752 ft. It topped the pay at 1,589 ft. and was shot with 730 qt. of nitroglycerin. Location is 2,970 ft. from the north and 1,760 ft. from the east line of Section 64-97, H.&T.C. Survey.


Used throughout the Oil Industry...

NH VALVES



for the oil industry cover a wide range of specialized productions. Gate, Stop and Check Valves for high pressures and temperatures, steam, oil and gas, and for general purposes. Also Newman-Milliken Glandless Lubricated Plug Valves for Christmas Trees and all oil field purposes. Working pressures to 3,000 lbs. per sq. inch. (Tested to 6,000 lbs. per sq. inch Kerosene.) Made in various metals to suit particular services.



The Newman-Milliken Glandless Lubricated Plug Valve has many unique features . . . a parallel plug always in close working contact with its body seating—no grit can therefore get between these two surfaces. No gland, no packing, no gaskets. Self sealing and a visual check on full lubrication. Port openings equal to full size area. Opened and closed by a quarter turn of the plug.

Newman, Hender & Co. Ltd

WOODCHESTER, NH GLOS. ENGLAND.

### NORTHERN WEST TEXAS COMPLETIONS

Mascho-University, Andrews County: Cross & Johnson 1 University, SW NW Sec. 23, Blk. 10, University Sur., pumped 132 bbl. plus 4 per cent water after shot, pay 4,520 ft., T.D. 4,578 ft.

West Andrews, Andrews County: Kewanee 1 University-Bascom, SW NE Sec. 13, Blk. 11, University Sur., flowed 464 bbl. per day after shot, top pay 4,300 ft., T.D. 4,435 ft.

Phillips Pet. 15 University-Andrews, SW SE Sec. 1, Blk. 11, University Sur., flowed 75 bbl. in 9 hr. through open tubing, top pay 4,211 ft., T.D. 4,355 ft.

Slaughter field, Cochran County: Magnolia 10-C Mallett, NW NW Lab. 6, Lge. 51, Scurry CSL Sur., flowed 1,182 bbl. per day, top pay 5,010 ft., acid. 9,000 gal., T.D. 5,068 ft.

Magnolia 15-C Mallet, SE SE Lab. 22, Lge. 53, Scurry CSL Sur., pumped 219 bbl. per day, 10 per cent water, top pay 5,015 ft., T.D. 5,055 ft.

Texas Pacific C. & O. 3 N. H. Tarver, NE NE Lab. 15, Lge. 55, Oldham CSL Sur., flowed 1,165 bbl. per day, top pay 5,004 ft., T.D. 5,055 ft.

Cedar Lake, Gaines County: Geo. Livermore 3 Jones, SE SW Sec. 2, Blk. C-30, PSL Sur., swabbed 458 bbl. per day, natural, top pay 4,680 ft., T.D. 4,730 ft.

Stanolind 5 Bremont, NE NE Sec. 3, Blk. C-30, PSL Sur., swabbed 149 bbl. per day, top pay 4,742 ft., T.D. 4,830 ft., after shot.

Slaughter field, Hockley County: Geo. Livermore 6 Glimp, NW SW Sec. 8, Blk. X, PSL Sur., flowed 1,732 bbl., pay 4,997 ft., T.D. 5,025 ft.

T. F. Morrow 5 Mallet, SW SW Lab. 22, Lge. 48, Edwards CSL Sur., flowed 996 bbl., pay 4,995 ft., T.D. 5,000 ft., acid. 10,000 gals.

T. F. Morrow 6 Mallett, SE SE Lab. 22, Lge. 48, Edwards CSL Sur., flowed 1,127 bbl. daily plus 4.5 per cent water, pay 4,933 ft., T.D. 5,000 ft., acid. 10,000 gal.

Texas Pacific C. & O. 1 Rains County, SW SW Lab. 11, Lge. 42, Rains CSL Sur., flowed 477 bbl., pay 4,904 ft., T.D. 4,941 ft., acid. 10,000 gal.

Western States Gasoline Corp. 17-B Mallet, SW SW Lab. 25, Lge. 49, Scurry CSL Sur., flowed 1,098 bbl. per day, pay 4,985 ft., T.D. 5,047 ft., acid 12,500 gal.

Iatan field, Howard County: Mid-Continent Pet. 5-B Denman, 2,309 ft. from W line and 997 ft. from S line Sec. 16, Blk. 30, Twp. 1s, pumped 146 bbl. per day, pay 2,670 ft., T.D. 2,880 ft., shot 500 qt.

Sharon Ridge, Mitchell County: F. W. Merrick 4-B Strain, 2,298 ft. from S line and 1,763 ft. from E line Sec. 64, Blk. 97, H.&T.C. Sur., pumped 99 bbl. per day, pay 1,589 ft., T.D. 1,752 ft., shot 730 qt.

Wasson field, Yoakum County: American Liberty-Atlantic 10 Johnson, NE NW Sec. 772, Gibson Sur., flowed 128 bbl. per day plus 2.9 per cent water, pay 4,965 ft., T.D. 5,261 ft., acid. 10,000 gal.

---

### SOUTHERN WEST TEXAS

Wildcats in Pecos and Crane counties held chief interest in south part of the Permian basin last week. Magnolia Petroleum Co. 1 Alan Robertson, wildcat 13 miles northwest of Fort Stockton, cored fine-grained sand with some stain and odor from approximately 6,510-58 ft., made several drill-stem tests of the section, but recovered only drilling mud with slight gas shows; last cores from 6,551-61 ft., after correcting depth of 6,558 to 6,551 ft., had no recovery, and electrical survey of hole was being made. This deep test is located in a sort of geological "no man's land" between the Delaware basin on the west and the big Fort Stockton uplift on the east. Sand section topped at 6,510 ft. may be in the Delaware section.

M. D. Bryant 1 McDonald, Ordovician wildcat in the Rowan-Tong area, northern Pecos County, was plugged and abandoned at 5,666 ft. in Ellenburger dolomite topped at 5,250 ft.; it showed sulfur water on drill-stem test from 5,561-5,666 ft., had no shows of oil or gas in the Ordovician section.

Skelly Oil Co. 1 Richardson, Ordovician wildcat in southeastern Crane County, and about 7 miles north of the 4,400-ft. Gulf-Wentz Ellenburger field in Pecos County, was rumored in the Ordovician at 5,064 ft., but no information was being released by the operators. Some royalty buying near the well was reported late last week.

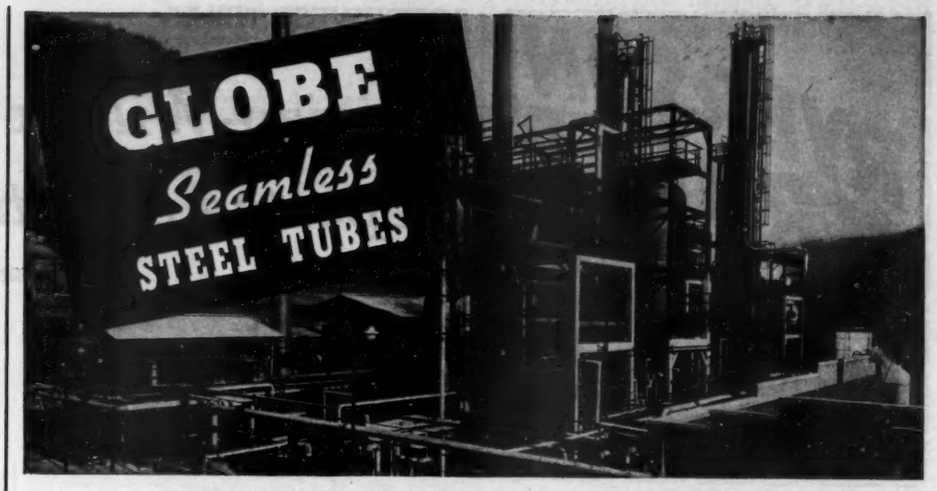
Schleicher County's Page gas field gained a new producer, and a ½-mile north extension, as Cooper Gas Co. 1-D-39 Page was completed from Strawn pay between 5,305-5,570 ft. for 30,000,000 cu. ft. of gas daily, with gas-fluid ratio of 109,900 to 1.

### SOUTHERN WEST TEXAS COMPLETIONS

**Wildcats**

Pecos County: M. D. Bryant et al 1 J. A. McDonald, SW NE Sec. 46, Blk. 12, H.&G.N. Sur., elev. 2,480

*(Continued on Page 245)*


**. . . CORROSION AND WEAR-RESISTANT FOR OIL PRODUCTION AND REFINING SERVICES**

Specializing in the manufacture of seamless steel tubing, The Globe Steel Tubes Co. is a dependable source of supply for tubes for a wide range of oil production and refining services:

- CARBON AND ALLOY STEEL TUBES —corrosion and wear-resistant for well connections, mud pumps, dehydrators.
- SEAMLESS BOILER TUBES—for field boilers.
- STILL TUBES—Carbon, Carbon-moly, Low and Intermediate Chrome, Stainless Steel, Special Analyses for Catalytic and Polymerization Processes.
- CONDENSER AND HEAT EXCHANGER TUBES —corrosion and erosion-resistant Low Alloy and Stainless Steel Tubes for Refinery Service.

*Consult Globe Steel Metallurgists on Tubing Problems.*

GLOBE Seamless TUBES

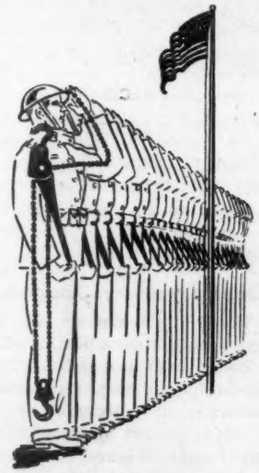
**GLOBE STEEL TUBES COMPANY**

4011 W. Burnham Street MILWAUKEE, WIS.

**COFFING Safety Pull RATCHET LEVER HOISTS**

Are on the job for UNCLE SAM

Conserve Your Hoists and HELP WIN THE WAR



See Your Distributor or Write for Catalog No. G-6

**COFFING HOIST COMPANY**

Ratchet Lever Hoists Spur Geared Hoists Electric Hoists

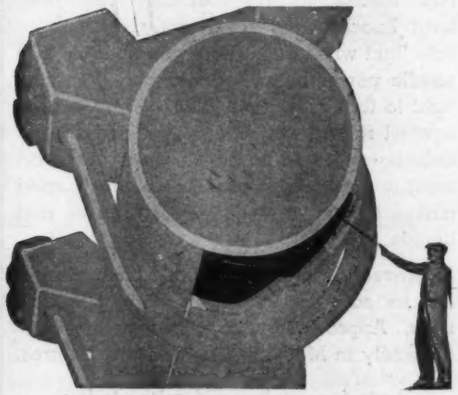
800 WALTER ST. DANVILLE, ILLINOIS

**REPAIR LEAKS**

QUICKLY
PERMANENTLY
ECONOMICALLY

*With the original*

**"GRO-CORD" GASKETS**



Instances where repairs were taken up after 5 years GRO-CORD GASKETS showed no signs of deterioration.

**LIMA CORD SOLE & HEEL CO.**

Lima, Ohio, U. S. A

Manufacturers of the famous GRO-CORD soles and heels.

RYERSON CERTIFIED STEELS

Principal products include—Alloy Steels, Tool Steels, Stainless Steel, Hot Rolled Bars, Hoops and Bands, Beams and Heavy Structurals, Channels, Angles, Tees and Zees, Plates, Sheets, Cold Finished Shafting and Screw Stock, Strip Steel, Flat Wire, Boiler Tubes, Mechanical Tubing, Rivets, Bolts, etc. Write for Stock List. Joseph T. Ryerson & Son, Inc. Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

634 CANDLE POWER
Plus
The Safety You Need

JUSTRITE
Twin-Bulb
ELECTRIC LANTERN

Preferred by the Industry

HERE'S the all-'round stamina-built twin-bulb electric lantern that can take those hard knocks—and consistently dish out a safe light when and where you need it. 634 candle power beam forward and plenty of light to the sides. Twin bulb feature guards against failure—flip the switch and second bulb lights instantly. Built for easy replacement of parts. Approved safety construction makes it safe around "pop-off" gases and liquids.

Approved by Underwriters' Laboratories, Inc. for safe use in Class 1, Group D locations. Approved by U. S. Bureau of Mines for safety in Methane Gas and air mixtures.

*Write for catalog and prices today.*

JUSTRITE MANUFACTURING COMPANY
2061 Southport Avenue Chicago, Illinois

JUSTRITE
Safety Products
SAFETY CANS · FILLING CANS · OILY WASTE CANS
APPROVED SAFETY ELECTRIC LANTERNS

## SOUTHWEST TEXAS

# Carrizo-Wilcox Showings Reported in Pettus Deep Test

By F. L. SINGLETON

CORPUS CHRISTI, Tex. — The outcome of a scheduled production test of Union Producing Co. 58 George Ray, located in the old Pettus field, Bee County, was holding the major share of interest in field developments of the Southwest Texas district. With the hole bottomed at 7,010 ft., casing was perforated in the Carrizo-Wilcox sand at 6,943-64 ft. and the well was reported to be ready for testing at the end of the week. While details of the core record of this well were not available, several sections in the Carrizo-Wilcox topped at approximately 6,900 ft. are reported to have showed possible gas or distillate production.

The search for Carrizo-Wilcox production in proven fields located along the Jackson trend of Southwest Texas has been anticipated following the opening of crude production on the south flank of the Caesar field earlier in the year. This phase of development is still in the early stages of development but can be expected to be extended for the next several months.

Exploration along the trend was enhanced further by the opening of gas-distillate production in the Berclair area, Bee County, located several miles downdip from previous development. The discovery well, Magnolia 1 E. H. Buckner, 2 miles southwest of the town of Berclair, tested a small amount of gas and distillate through new perforations at 10,398-10,404 ft., and after squeezing off with cement and reperforating at 10,370-98 ft. the well is flowing an unestimated amount of wash water, distillate and gas while testing through a 5/64-in. choke. Tubing pressure is 2,150 lb.

Tide Water 1 Gips, De Witt County, reported in error last week as being abandoned due to mechanical trouble, is still testing and a potential test was scheduled to be made the first of the week. On a recent gage it flowed 36 bbl. of oil and 34 bbl. of salt water from casing perforations just below 7,000 ft. Gravity of the oil tested 40°. This discovery will be known as the Nordheim area, and looms as an important addition to the growing list of Wilcox sand discoveries that have been opened along this particular sector of the trend. In addition to the present producing sand which is near the top of the Wilcox formation, other sands capable of producing either gas or distillate have been logged at 8,300 ft., 7,300 ft. and 7,100 ft.

### Cockfield Sand Discovery Completed

Taylor Refining Co. 1 Cadena, the discovery well of a new Cockfield sand pool, 2 miles northeast of the Tesoro field, Duval County, was officially completed for an initial production of 65 bbl. of 44-gravity oil daily through a 5/8-in. choke. The well is located in Survey 306, and is producing from sand at 5,269-75 ft. Thus far no new locations have been made.

In Jim Hogg County, and located about 8 miles east of the Colorado field, Sun 1-D T. T. East, Santo Domingo de Arriba grant, was in the process of testing and the prospects of opening a new field were considered good. The total depth is 5,303 ft., and casing was cemented preparatory to testing sand at 4,735-39 ft. and at 3,998-4,003 ft. Drill-stem testing in the 4,700-ft. sand recovered oil and some salt water, while testing at 3,998-4,003 ft. showed gas.

The producing area of the South Campana field, McMullen County, was being extended several hundred feet to the northwest as casing was ce-

*(Continued on Page 245)*

G.A. WELDING Shop Notes

AFTER THE WAR...WHAT?

Many producers are already considering plans for the time when the national emergency will be over. Obsolete and worn-out equipment must be replaced. New processes, new developments will require additional and different installations. It is good judgment to prepare for the future. The engineers and chemists of General American's Plate & Welding Division welcome an opportunity to counsel with you on immediate or future problems involving steel plate equipment.

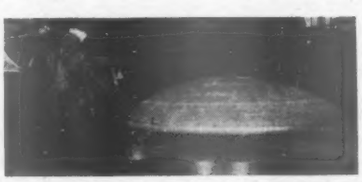


PLATE AND WELDING DIVISION
GENERAL AMERICAN TRANSPORTATION CORPORATION

Cable Address
GENTANWELD
Sharon, Pa.

GATX GENERAL AMERICAN
PLATE & WELDING DIVISION
PLANT AT SHARON, PA.

Offices In All Principal Cities

# Report Ellenburger Production West of Vogtsberger Field

By ROBERT INGRAM

WICHITA FALLS, Tex.—A new Ellenburger lime oil pool for Archer County has been opened by the Perry Browning 1 fee, Lot 87, Block 7, G.E.C. Survey, 1 mile west of the Vogtsberger Strawn sand-Caddo lime pool in the northeast part of the county. When opened after a 24-hour shutdown to build up pressure, 5,000 ft. fluid was found in the hole. The operator ran the swab eight times, recovering 75 per cent acid water and after an overnight shut-in, oil. Operator was continuing the test. Information filed with the Railroad Commission office at Wichita Falls is that the well is good for 500 bbl. of oil daily from saturated Ellenburger at 5,321 ft. to 5,330 ft., total depth, after treatment with 10,000 gal. acid. The test had nothing in the Caddo or Mississippian, but a good showing in the basal Strawn.

One location north and west extension for the Hapgood Caddo lime pool of eastern Clay County is the Lipscomb 1 Grimes, Block 60, Marion County School Lands. The test topped the Caddo at 5,912 ft. A 10-minute drill-stem test from 5,972 ft. to 5,983 ft. returned 170 ft. of oil and 17 ft. of oil-cut mud with bottom-hole pressure of 2,300 lb. Operator was preparing to run 5½-in. casing.

### Show of Lower Caddo in Throckmorton

In the Mathews pool of southwestern Throckmorton County, 9½ miles southwest of the town of Throckmorton, Humble 1 Matthews, Alvin Tarter Survey, drilled lime showing oil in the lower Caddo from 4,375 to 4,425 ft. and more saturation at 4,588-4,613 ft. and is setting casing to test.

### Wildcat Shows Saturated K.M.A. Lime

Attention in the play for deep production in Archer County was centered on the George Cooper 1 Moody, Block 1, S.P. Survey, 1 mile west and a little south of Holliday. The wildcat topped the K.M.A. lime of the Strawn section at 4,108 ft. and drilled saturated lime from 4,120 ft. to 4,124 ft., total depth, and operator was running casing to test. This is apparently the same pay which the Cooper 1 Knight, Block 69, Wichita Farm Lands found, although the well was not completed in this pay.

Shell Oil Co. C-5-G Dickey Coleman, Lot 2, Block 74, Mississippi lime test in the Coleman Caddo-Mississippi lime pool of eastern Archer County drilled plug and flowed 4 bbl. of salt water hourly from 5,660 ft. Hole was cemented by operator who is waiting for it to set.

Shell Oil Co. 1-D Bullock, Block 344, in the Padgitt Mississippi lime pool of western Young County, 8 miles northwest of Newcastle, was completed to flow 624 bbl. of oil and 120 bbl. of salt water in 24 hours through tubing. Pay was from 4,744-99 ft.

### Montague Wildcat Testing Ellenburger

Continental 1 Hildreth, Block 53, E.T. Survey, northeast of the Turner pool in southwest Montague County, topped the Ellenburger at 7,240 ft. and drilled to 7,256 ft. and was preparing to test. This wildcat drilled showing of oil from 7,240 ft. to total depth. Originally 7-in. casing had been cemented at 6,549 ft. and the 5 3/16-in. casing was cemented at 7,100 ft.

In extreme southwestern Montague, Sinclair Prairie Oil Co. 1 Eanes, G. A. Bench Survey, 8,000-ft. wildcat test, was testing an oil show in the Simpson around 6,690 ft.

### NORTH TEXAS COMPLETIONS

#### Wildcats

Archer County: H. S. Gray 1 W. B. White, Sec. 19, D.C.S.L. L-3, A-117, abandoned location.

R. E. Hansen 1 F. McAnally, Lot 13, G. P. Meade L-M Pasture subdivision, dry, T.D. 1,456 ft.

Clay County: Wilder Drilling Co. 1 J. B. Dunn, Lot 24, Byers Bros. subdivision, dry, T.D. 1,870 ft.

Montague County: H. F. Gibson 1 Pyeatt & Boland, J. W. Carter A-135, T.D. 4,455 ft.

Wichita County: Fortex Oil 1 J. D. & Lee Cooper, Lot 4 of H. Hastie A-92, dry, T.D. 1,361 ft.

C. Y. Gorman 1 B. B. Greever, S and E of A. Bingham A-16, dry, T.D. 1,241 ft.

J. H. Turner 1 W. L. Scott, SW SW Sec. 15, Tarrant Co. Sch. Ld. A-282, dry, T.D. 1,107 ft.

Young County: Hanlon-Buchanan, Inc., 2 H. B. Street et al, SW SW of J. Conner A-57, flowed 494 bbl. natural, T.D. 4,080 ft. *Discovery.*

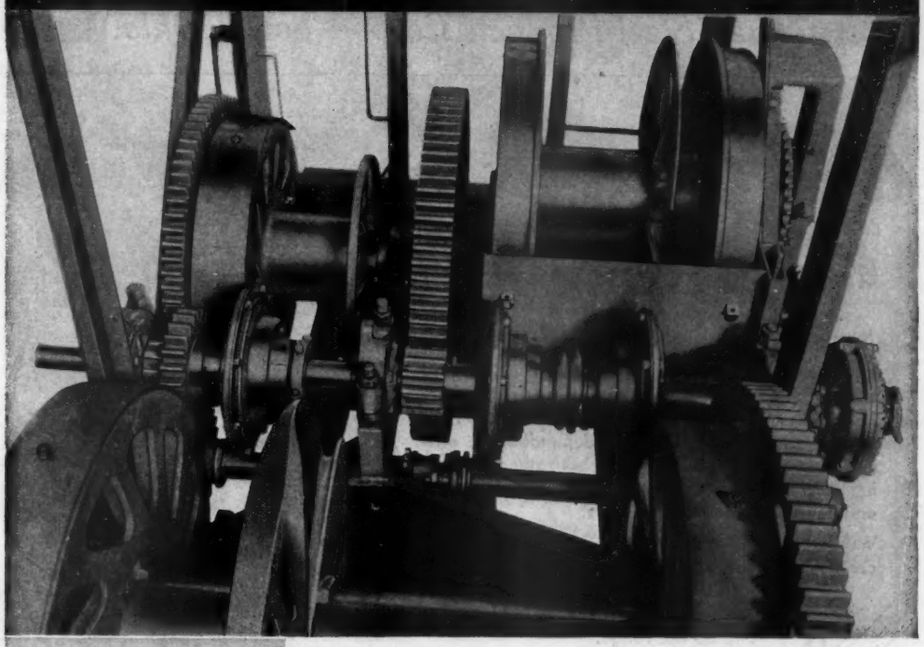
#### Fields

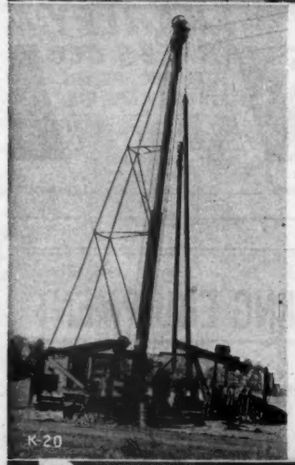
K.M.A., Wichita County: W. H. Hammon 15 W. H. Hammon, Sec. 2, E.T. Sur., Blk. A-726, potential 448 bbl., gas-oil ratio 233 to 1, gravity 41, T.D. 4,043 ft.

K.M.A., Ellenburger: Kadane-Griffith Oil 6 Mrs. Anne Mangold, Lot 39, Mangold subdivision, P. Castleman A-35, abandoned location.

Knox, Young County: Ohio Fuel Oil Supply 1 Mrs. Eugenia Taylor, Sec. 1975, T.E.L. Sur., potential


TWO speeds forward and INSTANTANEOUS REVERSE





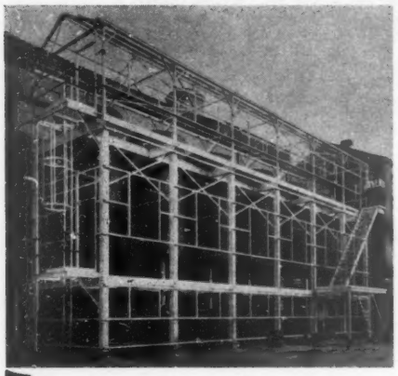

Two speeds forward and **instantaneous** reverse is one of the sweetest tricks Bucyrus-Erie has built into their new 36-L spudder. Plus the big equalized twin brakes on bull and sand reels, it means speed and control on the lines that saves a lot of time on any type of drilling or servicing. For instance, you can pull 4,200 pounds of tools from 3,000 feet in 8 minutes in high, or throw into low and get a pull of 14 to 15 tons to haul out of trouble. With the sand reel in high, you can take a 7"x30' bailer 3,000 feet in 3 minutes. And the calf reel gives you to 47 tons of pull with 6-part tackle.

Here's a machine that is writing spudder history. Get in on it. Let it write its story of modern speed on your books.

Bucyrus-Erie

SOUTH MILWAUKEE, WISCONSIN

# Structural STEEL Fabrication



*Steel framework designed, constructed and erected by Allied.*

ALLIED PRODUCTS STEEL

Write For 1942 Catalog

**CAPACITY AVAILABLE**

The Allied Steel Products Corp. is equipped to handle light and medium weight structural steel work. All shop connections are electric arcwelded and fabricated for field welding, bolting, or riveting.

**ENGINEERING AND DESIGNING**

A complete engineering department is maintained to assist in the planning and designing of your structural steel requirements.

**FABRICATION AND ERECTION**

Allied will fabricate and erect any type of structural steel framework or unit which comes within the above classifications.

**INQUIRIES SOLICITED**

Because of the individual nature of structural steel fabrication needs, Allied solicits inquiries. State your needs, type of structure contemplated, use, and other details. Allied will submit designs and plans and will quote prices. No obligation.

1407 NO. PEORIA

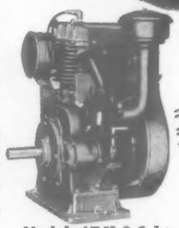
*Allied Steel Products Corp.—Tulsa, Okla.*



# NO Horsepower "Watering" chores

"Horsepower", in its original natural state, must have water. But the maintenance burden and trouble risks of water-cooling for modern *engine horsepower* is something we can do without . . . *without* sacrificing heavy-duty dependability, efficiency, or economical operation but rather, *improving all three* . . . plus the advantage of less weight and fewer critical-material parts.

WISCONSIN HEAVY-DUTY AIR-COOLED ENGINES are designed for all-out serviceability on all counts . . . on any kind of equipment that can be operated advantageously within a 1 to 35 hp. range.



*Model ADH 3-5 hp. single cylinder Engine.*

AIR-COOLED

MOST POWER Per POUND

WISCONSIN MOTOR Corporation

MILWAUKEE, WISCONSIN, U. S. A.

*World's Largest Builders of Heavy-Duty Air-Cooled Engines*

WRITE TO HARLEY SALES CO.

510 ATLAS BLDG., TULSA, OKLA.

M & M BLDG., HOUSTON, TEXAS

OIL FIELD DISTRIBUTION FOR WISCONSIN ENGINES AND ALL TYPES OF UTILITY UNITS



## For PIPE CLEANING and STRAIGHTENING EQUIPMENT

*Illustrated Catalog Sent on Request.*

**NEW DEAL SPECIALTY CO.**

1080 North Peoria Ave. TULSA, OKLAHOMA, U. S. A.

EXPORT: Lucey Export Corporation, 3505 Woolworth Bldg., New York City


50 bbl., lime show 4,415-49 ft., T.D. 4,452 ft., P.B. 4,449 ft.

Padgitt, Young County: Shell Oil 1 J. W. Bullock, Sec. 344, T.E.&L. Sur., potential 625 bbl., T.D. 4,799 ft.

Petrolia, Clay County: W. H. Spradling 2 C. T. Taylor Est. "Elliott," Lot 56, Bacon subdivision, dry, T.D. 1,161 ft.

Sanders, Montague County: Sinclair Prairie 1 Mary McCall, Sec. 134, J. H. Belcher subdivision, conglomerate pay 5,933-63 ft., potential 1,101 bbl., T.D. 5,963 ft.

Thornberry, Clay County: Sussex Oil 29 C. J. Shumake, Lot 3, Bacon subdivision, dry, T.D. 1,160 ft.

**Miscellaneous**

Archer County: Morgan & Turner 12 R. J. Andrews, Sec. 2437, T.E.&L. Sur., potential 5 bbl., T.D. 1,424 ft.

Young County: Tex-Tor & McLester 7 L. Moseley, NW cor. of G. W. Parker A-1513, but in B. Moseley A-2222, flowed 752 bbl., T.D. 3,794 ft.

### WEST CENTRAL TEXAS COMPLETIONS

**Wildcats**

Coke County: Fain-McGaha 1 E. C. Nichols, Sec. 337, Blk. 1-A, H.&T.C. Sur., dry, T.D. 3,830 ft.

Comanche County: F. O. Akin 2 H. Bellamy est., Sec. 12, Blk. 2, H.&T.C. Sur., dry, T.D. 3,116 ft.

Jones County: T. D. Humphrey 1 L. E. C. Boyd, Mica Ela Fragsos Sur. 209, dry, T.D. 1,502 ft.

Shackelford County: Joiner & Haggerty 1 L. Robinson, Sec. 43, B.A.L. Sur., dry, T.D. 792 ft.

Taylor County: Butler & Horne et al 1 S. M. Redding, Sec. 24, Blk. 17, T.&P. Sur., flowed 183 bbl. through ¾-in. tubing choke, natural, est. 450 bbl., pay 2,248-51 ft., T.D. 2,251 ft.

B. & W. Oil 1 Guitar Trust est., Sec. 59, B.A.L. Sur., dry, T.D. 3,468 ft.

**Fields**

Strawn, Palo Pinto County: Palo Pinto Oil & Gas 8 Mount Marion Coal, Isaac Ryan Sur., Abst. 388, dry, T.D. 3,360 ft.

**Miscellaneous**

Eastland County: Lone Star Gas 7 W. H. Graves, Sec. 487, S.P. Sur., old well, old T.D. 3,575 ft., potential 98 bbl. after acid, T.D. 3,920 ft.

## Michigan Fields

*(Continued from Page 226)*

a moderate daily average decline over July. The association said 3,224 producing wells yielded 1,906,941 bbl. of oil during the month, a daily average of 61,511 bbl. A somewhat better outlook was indicated for September.

### MICHIGAN COMPLETIONS

Arenac County, Adams Township: E. G. Thompson 1 Hanggi, C SE SE 26-19n-3e, pumping 17 bbl., acidized, T.D. 4,227 ft.

Bay County, Kawkawlin Township: Gulf Refining Co. 1 Davidson, C S½ SE NE 33-15n-4e. pumped 80 bbl. first 17 hr., acidized, T.D. 2,941 ft.

Monitor Township: Gulf Refining Co. 2 Schweitzer, C S½ NE NW 12-14n-4e, pumping 20 bbl., acidized, T.D. 2,858½ ft.

Clare County, Redding Township: Sun Oil Co. A-4 State-Redding, C NE SE 1-19n-6w, dry, T.D. 3,830 ft.

Sun Oil Co. A-5 State-Redding, C NE NW Sec. 1, location abandoned.

Franklin Township: Pure Oil Co. 2 Trubell, C N½ NE SW 3-20n-3w, 245 bbl. natural, T.D. 3,336 ft.

Winterfield Township: Pure Oil Co. 1 McClain, C E½ SE SE 30-2n-6w, 257 bbl. acidized, T.D. 5,060 ft., P.B. from 5,100 ft.

Lake County, Sauble Township: Swanson Consolidated Oil Co. 1 Meyeres estate, C N½ NW SE 16-19n-14w, pumping 10 bbl. and salt water, acidized, T.D. 2,156 ft.

Mecosta County, Fork Township: Sun Oil Co. 1 Murray, C S½ NW SW 5-16n-7w, 519 bbl. pinched, T.D. 3,818 ft.

Missaukee County, Riverside Township: Taggart Brothers Co. 57 VanderWoude-Meekhoff, C NE 21-21n-7w, 3,720,000 cu. ft. natural gas, T.D. 1,452 ft.

Taggart Brothers Co. 56 Missaukee County Road Commission-Maxwell, C NW Sec. 20, 1,010,000 cu. ft. natural gas, T.D. 1,519 ft.

Taggart Brothers Co. 93 Burgess-Stone-Toland, C NW Sec. 29, dry, T.D. 1,440 ft.

Muskegon County, Casnovia Township: Casnovia Development Co. 1 Westcott, NW NW SW 22-10n-13w, wildcat, dry, T.D. 2,920 ft.

Ravenna Township: Robert L. Sanders 1 Rams, SE SW NE 30-9n-14w, widcat, dry, T.D. 2,601 ft.

Oakland County, Springfield Township: Drohner & Rauffus, Tr., 1 Rauffus, NE NE SW 2-4n-8e, wildcat, dry, T.D. 1,996 ft.

Osceola County, Osceola Township: Sun Oil Co. 2 Cook, C N½ NW NE 27-18n-8w, 15 bbl. and salt water, acidized, T.D. 3,792 ft.

Ottawa County, Zeeland Township: J. E. Hood 1 Dekker, SE NE SE 30-5n-14w, dry, T.D. 1,688 ft.

E. W. Leeder 1 Nykamp-Leeder communitized, SE NE NW Sec. 32, dry, T.D. 1,512 ft.

Roscommon County, Richfield Township, Sun Oil Co. 1 St. Helen Resort Association, C N½ SE SE 20-24n-1w, 38 bbl., acidized, T.D. 4,333 ft.

Roscommon Township: Freeman Oil Co. B-1 State, SE SW SW 32-21n-4w, wildcat, dry, T.D. 4,393 ft.

ROCKY MOUNTAIN AREA

# Shallow Circle Ridge Field Has Embar Lime Production

By T. R. INGRAM

DENVER, Colo.—An oil well that will bail 15 bbl. an hour at a total depth of only 278 ft. is what any operator might call a "sweet" well, but when by going a few feet deeper it can repeat the performance, it may be classed as unusual. Such a well is Continental 7 Shoshone, in the Circle Ridge field, Fremont County, Wyoming. It bailed 15 bbl. an hour from the Embar at 170-278 ft. Of still additional interest is the fact that it is 1⅓ miles above sea level.

A year ago Continental completed 3 Shoshone at this location for 191 bbl. in 24 hours on the pump from the Tensleep at 395-660 ft. That was the maximum capacity of the pump rather than of the well itself. The Embar was cased off in accordance with government regulations. No. 7 Shoshone is a twin well drilled to produce from the Embar. The operator will drill two more twin wells to the Embar and the development of the field will have been completed. A power then will be installed to produce the wells. So far, with one exception, the wells have been shut in after bailing tests.

### Oregon Discovery Rumored

A report from Oregon says that O. W. Clark et al, drilling in the SE 6-24s-33e, near Burns, in Harney County, has encountered a 70-ft. oil sand around 1,200 ft. It has not been confirmed and no further details are available. Ten years ago there was some activity in that district and several tests were started, but the interest temporarily died down. One of these was in 9-24-32 and another in 7-23-30, indicating that the wildcatters had some evidence of struc-

Glacier Production Co. 1 McGuiness unit, C NW 8-35n-5w, a completion last week in the north end of the Cut Bank field, which flowed 800 bbl. in 23 hours from the Sunburst sand, being the second largest producer from that horizon in the field, and which was drilled for gas, averaged 700 bbl. a day natural on a 10-day test. The oil at the start tested 44.6 gravity on the Baume scale, but increased to 47 gravity.

Minelusa Oil Corp. et al 1 Bora, SE NE SW 5-1s-69w, El Dorado district, Boulder County, Colorado, an important wildcat, is at a critical depth. It is drilling below 8,800 ft. and feeling for the Muddy sand, the first objective.

The Santa Rita Oil & Gas Co. 1 Kruger, the first well drilled in the North Cut Bank area for some time, a completion this week, looks as though it will make a small producer in the base of the Sundance after going into water in the Cut Bank and plugging back. It had 5,000,000 cu. ft. of gas in the upper part of the Sunburst. The well is located ½ mile southeast of 1 Jacobson, the discovery in that area in 1933, which pumped 62 bbl. in 20 hours, showing some water. Last year 2 Jacobson was drilled in between the discovery and 1 Kruger and swabbed 135 bbl. in 24 hours from the Cut Bank. A little more than half a mile to the south, 1 Lungren, in 1938, flowed 70 bbl. a day from the upper Sunburst, which probably correlates with the gas horizon in 1 Kruger.

A. B. Cobb & Co. are builing rig for 1 Allotted-223, NE NW NW 4-29n-8w, Pondera County, Montana, southwest of the Cut Bank field, in the Blacktail district. Location is 5 miles west and 1 mile north of Texas 1 Kingsbury in 8-29-7, which recently went to 4,208 ft. in search of an extension of the Cut Bank shore line, which is supposed to trend in that direction. The latter was in the Dupuyer area.

Sinclair-Wyoming Oil Co. has made

*(Continued on Page 251)*

CURTIN CENTRIFUGES

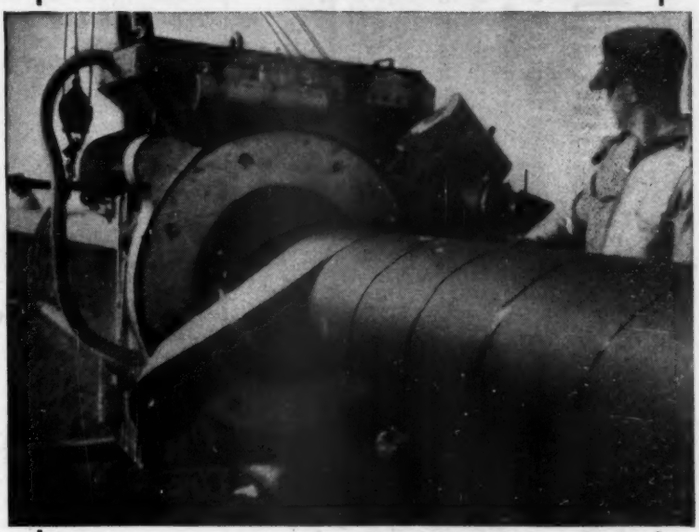
Give you Quick, Accurate Results With *Less Effort* . . . . at *Less Cost*

Simple in design, ruggedly built for heavy duty service. Gear ratio and throw of crank produce required speed with no strain. Heads and cranks of 100 CC and 15 CC machines are interchangeable. **Meets A.S.T.M. Standard Method D-96 and A.P.I. Code No. 25 requirements.** Ask for full details.

W-H-CURTIN & CO. Inc

HOUSTON U.S.A. TEXAS

MAKE ONE JOB OF COATING AND WRAPPING . . .



*With This Johns-Manville Machine*

**You save both time and money when you use the J-M Machine shown here. It coats and wraps pipe in a single operation in the field . . . as fast as the line can be assembled. Application costs are considerably reduced. And for wrapping . . .**

***Asbestos Felt Gives LASTING Reinforcement***

**Strong and durable, J-M Asbestos Pipe-Line Felt effectively reinforces the coating against abrasion and distortion. Inorganic, non-tubular asbestos fibers prevent capillary action . . . cannot rot or decay. As a result, J-M Asbestos Felt assures efficient pipe-line service and continued low maintenance costs.**

**During the past 25 years, more than 30,000 miles of pipe have been protected underground with J-M Asbestos Felt. It will pay you to get full details on this lasting material, and complete information on the J-M Combination Coating and Wrapping Machine. Write for brochure D. S.-375, Johns-Manville, 22 E. 40th St., New York, N. Y.**

JM Johns-Manville

ASBESTOS PIPE-LINE FELTS

**Now is the time to TEST THIS SELF-LOCKING NUT ON YOUR EQUIPMENT**

of your test application, and the nuts will be sent without cost or obligation.

» *Write for folder explaining the Elastic Stop self-locking principle.*

ELASTIC STOP NUT CORPORATION • 2362 VAUXHALL ROAD • UNION, NEW JERSEY

SELF-LOCKING **NUTS** AND AIRCRAFT FITTINGS

Elastic Stop

THE war industries are now absorbing the entire output of the Elastic Stop Nut plants. Manufacturers of peacetime products cannot be served in production quantities until needs of the Army and Navy are met.

However it is not necessary to wait until after the war to investigate the advantages of this modern fastening. Samples are available now, for field or laboratory testing on any equipment, with a view to future use. Just specify your requirements, stating the nature


*If you haven't had that FREE list of important oil books, by all means send your request to the Book Department, The Oil and Gas Journal, Tulsa, Oklahoma.*

## APPALACHIAN FIELDS

# *Only Routine Reports From Deep Outpost Tests*

PITTSBURGH, Pa.—On Chestnut Ridge in South Union Township, Fayette County, Greensboro Gas Co. is drilling by a bailer at 6,475 ft. in 2 Barton and at No. 3 is drilling at 6,284 ft. New Penn Development Co., William E. Snee et al are shut down at 799 ft. in 2 Indian Creek Coal & Coke Co. In 1 Walters, Peoples Natural Gas Co. is drilling out cement at 4,151 ft.

On Laurell Ridge, Ligonier Township, Fayette County, New Penn Development Co. et al are drilling at 6,150 ft. in 1 John and Eleanor Beck.

### SOUTHWEST PENNSYLVANIA COMPLETIONS

Armstrong County, Kittanning Township: Equitable Gas Co. 1 William King, 84,000 cu. ft. gas, Mountain, Fifth and Tiona sands, T.D. 3,498 ft.

Greene County, Aleppo Township: Peoples Nat. Gas Co. 7 Elisha Rinehart, 60,000 cu. ft. gas, Big Injun sand, T.D. 3,535 ft.

Monongahela Township: L. J. Houze-Convex Glass Co. 1 E. R. Gabler, 1,500,000 cu. ft. gas, drilled deeper from 1,495 ft., Big Injun sand 1,454 ft., gas 1,565-70 ft., T.D. 1,585 ft.

Washington County, Hanover Township: G. Freshwater Co. 2 R. D. Koethe, 5 bbl., Big Injun sand at 1,148 ft., T.D. 1,160 ft.

### WEST VIRGINIA

In Clay district, Hancock County, John T. Galey et al, in the test on the Lenora Ramsey farm, are cleaning out at 4,795 ft. after shot and intend to drill through the Oriskany sand before shooting again.

In Grant district, Ritchie County, Benedum & Trees are drilling at 7,293 ft. in their test on the J. L. Rinehart farm. In Meade district, Tyler County, they are shut down at 6,035 ft. in the test on the Pearl Broadwater farm. In Springs Creek district, Wirt County, their test on the Park Smith farm is drilling at 4,035 ft. In Union district, Pleasants County, they are fishing at 5,362 ft. at the W. W. Campbell and at 960 ft. in the H. E. Criner test in Reedy district.

### WEST VIRGINIA COMPLETIONS

Barbour County: Elk district: Hope Natural Gas Co. 8612 David Segley, 440,000 cu. ft. gas, Benson sand 4,501-10 ft., gas 4,502-08 ft., T.D. 4,557 ft.

Brooke County, Cross Creek district: Wheeling Steel Corp. 33 fee, dry, Berea, T.D. 1,340 ft.

Calhoun County, Center district: Hope Natural Gas Co. 2-8616 C. R. Vandervender, 119,000 cu. ft. gas, Big Injun sand 2,075-2,150 ft., gas 2,115 ft., T.D. 2,186 ft.

Lee district: Hope Natural Gas Co. 2-8627 Bennett Summers, 75,000 cu. ft. gas, Big Injun 2,007-41 ft., gas 2,015-20 ft., T.D. 2,063 ft.

Sheridan district: South Penn N. G. Co. 7 Frank Rothlisberger, 590,000 cu. ft. gas, Salt sand, T.D. 1,870 ft.

Sherman district: Bowser Gas Co. 3 Edith Z. McDonald, 4 bbl. after shot, Big Injun sand 2,088-2,146 ft., oil 2,126-36 ft., T.D. 2,182 ft.

Washington district: Hope Natural Gas Co. 4 Louis Bennett, 1,320,000 cu. ft. gas, Big Injun sand 2,203 ft., gas 2,208-20 ft., T.D. 2,222 ft.

Gilmer County, Glenville district: Phillip Lemmon 1 James W. Keith, 539,000 cu. ft. gas, Blue Monday sand 1,630-58 ft., gas 1,645-58 ft., T.D. 1,841 ft.

Logan County, Logan district: Boone County Coal Corp. 29 fee, 33,000 cu. ft. gas after shot, Berea sand 2,819-49 ft., T.D. 2,869 ft.

Marion County, Mannington district: R. S. Monroe 1 Ethel Watson, dry, had 150,000 cu. ft. gas but blew out, Fifty-foot sand, T.D. 3,141 ft.

Monongalia County, Clay district: Roy W. Clovis 2 Carl H. Harker, dry, T.D. 1,535 ft.

Putnam County, Curry district: Carpenter Gas Co. 2 Millard and Boyd Carpenter DD, 84,000 cu. ft. gas after shot, Berea sand 2,081-2,105 ft., T.D. 2,125 ft.

Ritchie County, Grant district: West Virginia Inv. Corp. 27 Joe Parks et al, dry, Squaw sand, T.D. 1,954 ft.

Union district: Hope Natural Gas Co. 5782 D. H. Jones, 1 bbl., Big Injun sand, T.D. 2,027 ft.

Taylor County, Booth Creek district: Pittsburgh & West Virginia Gas Co. 6126, D. Bruce Mason, 150,000 cu. ft. gas, Big Injun sand 890-981 ft., gas 876-94 ft., 981 ft.

Wood County, Walker district: Clifton O. & G. Co., 3 Volcanic O. & G. Co., 13,000 cu. ft. gas, stray sand, T.D. 1,502 ft.

### ORISKANY GAS FIELDS

Jackson County, Ripley district: Columbian Carbon County 1 Lillian Parrish, 1,614,000 cu. ft. gas, after shot, Oriskany 5,164 ft., gas 5,167-95 ft., T.D. 5,242 ft.

One of the three roller members that circumscribe pipe and prevent any cutter from executing more than predetermined cut.
One of three cutter wheels made of high grade case hardened steel—easily replaced.
Bevel tool—same type as lathe—removes bead on pipe—cuts at slow speed—no cause for sparks.
Band breaches open, by removing one pin, in order to clamp around pipe.

**CUT YOUR PIPE SQUARELY IN 12 MINUTES OR LESS**

**With the Alston Ratchet Cutter**

The Alston Ratchet Cutter is a sturdy, powerful easy-to-operate pipe cutter that has been fully tested in the field with more than satisfactory results. The ratchet principle enables operators to work in close places — no need to dig expensive bell holes to cut buried pipe. The cutter may be slipped on or off by a simple operation of one pin.

Write for full information on this superior, time and money saving pipe cutter.

The patented Alston Ratchet Cutter is manufactured in straight sizes for specific size of pipe from 6" to 26" and in combinations to handle two sizes of pipe from 8" to 4" and 26" to 24".

MANUFACTURED BY

**ALSTON MACHINE SHOP**

*Exclusive Sales Representative*

**J. I. HILL COMPANY**

1011 SHELL BUILDING • P. 9004 • HOUSTON

# New Lansing Lime Gas Pool Opened in Edwards County

By CARL HOOT

A NEW gas pool for Edwards County was reported last week 17 miles east of Kinsley. The discovery well, Cities Service 1 English, NE NE NE 8-25-16w, gaged 19,200,000 cu. ft. of gas on initial open-flow gage through casing. The test followed an acid treatment in the Lansing series.

After the flow stabilized, another gage was taken which was reported by Cities Service officials as 6,710,000 cu. ft. daily. Production was found at depths from 3,916-27 ft.

In Rice County, C. H. Weaver et al 1 Katerjohn, E½ NE SW 11-19s-10w, ⅝ mile due west of the old Doran (Arbuckle) pool, acidized with 500 gal. after filling 200 ft. with oil in 2 hours from a total depth of 3,287 ft. in the Arbuckle dolomite. Operators are drilling deeper in an attempt to find better production.

### Wildcat Activity

N. Appleman et al 1 Bird, SW 33-18s-15w, Barton County, is shut down with no oil showings reported at a depth of 3,650 ft. No. 1 Bird, ¾ mile southwest of production in the Otis-Albert pool, topped the Reagan sand at 3,571 ft. and was drilled 79 ft. into the formation.

Ralph J. Pryor et al 1 Herman D. Ewers ranch, SW 7-32-14w, 3½ miles northwest of the discovery well of the new Hildebrandt (Viola lime) gas pool, has run a squeeze job preparatory to testing the Simpson formation. The well, drilled to a total depth of 5,010 ft. in the Arbuckle dolomite, was plugged back to the Simpson when the Arbuckle failed to show promise of production.

Auto Ordnance Corp. 2-R Sandell, NE NE 8-17s-3w, was waiting on tank room after drilling deeper from 3,462-64 ft. in the Simpson sand topped at 3,460 ft. After drilling out cement plug in 7-in. casing at 3,454 ft., oil rose 3,000 ft. in 4 hours, slopped over in 9¾ hours, and on a 2-hour swabbing test, 1,600 ft. off bottom, tanked 107 bbl. This test is an outpost well of the Lindsborg field.

### KANSAS COMPLETIONS

#### Wildcats

Butler County: Rex & Morris 1 Farha, SE NE SE 5-29s-6w, dry at 2,900 ft., Lansing 1,770 ft., Kansas City 2,155 ft., Bartlesville sand 2,770 ft., Mississippian 2,810 ft.

Greenwood County: A. H. Ponath 1 Defever, SE SW 9-28s-13e, dry at 1,264 ft., Bartlesville sand 1,230 ft.

Jefferson County: Magnolia 1 J. O. Burns, SE NE NW 33-11s-20e, dry at 2,167 ft., sand 1,232 ft., Bartlesville sand 1,424 ft., Mississippian 1,442 ft., Hunton 1,816 ft., Viola 1,932 ft., Wilcox 2,062 ft., Arbuckle 2,130 ft.

Kiowa County: Herndon Drlg. (Stanolind farmout) 1 Mary Dowell, NW NW NE 28-28s-16w, dry at 5,025 ft., Lansing 4,163 ft., Viola 4,793 ft.

Marion County: F. A. Gillespie & Heuser 1 Pritz, SE SE SW 29-18s-5e, dry at 2,808 ft., Lansing 1,750 ft., Mississippian 2,253 ft., Kinderhook 2,325 ft., chat 2,440 ft., Hunton 2,460 ft., Viola 2,545 ft., Simpson 2,634 ft., Arbuckle 2,707 ft.

Rooks County: Cities Service 1 Dorr, NE NW NE 20-9s-16w, 141 bbl. oil and 27 bbl. water, 10,000 gal. acid, Lansing 3,145 ft., pay 3,188-99 ft., T.D. 3,504 ft., *discovery well of Dorr pool.*

Rush County: Atlantic and Derby 1 Holtzmier, SW NW SE 12-16s-17w, dry at 3,613 ft., anhydrite 1,105 ft., Lansing 3,298 ft., Marmaton 3,515 ft., conglomerate sand 3,541 ft., Arbuckle 3,567 ft.

Stafford County: Auto Ordnance Corp. 1 Thole, SW SW SW 11-23s-12w, dry at 3,818 ft., Topeka 2,875 ft., Lansing 3,358 ft., base Kansas City 3,590 ft., Viola 3,729 ft., Simpson sand 3,778 ft., Arbuckle 3,788 ft.

#### Fields

Bemis, Ellis County: Champlin Refining 5 Hadley B, E½ SW SW 29-11s-17w, 109 bbl., 2,000 gal. acid, Arbuckle 3,505 ft., pay 3,516-28 ft., T.D. 3,528 ft.

Burnett, Ellis County: Lario O. & G. 1 Marshall E, NE SE NE 24-11s-18w, 120 bbl., 1,500 gal. acid, reacidized 3,000 gal., Arbuckle 3,378 ft., pay 3,378-3,425½ ft., T.D. 3,470 ft.

Chase, Rice County: Cities Service 2 Dick B, SW SW 9-20s-9w, 569 bbl., 1,500 gal. acid, Arbuckle 3,254 ft., pay 3,257-75 ft., T.D. 3,275 ft.

Bishop Oil (Shell farmout) 1 Reece B, SW NE 22-19s-9w, 166 bbl., 6,500 gal. acid, Lansing 2,876 ft., pay 2,876-3,175 ft., T.D. 3,252 ft., P.B. 3,175 ft.

Climax, Greenwood County: Ozenberger et al 1 Rush, NW NE 9-27s-11e, 681,000 cu. ft. gas, sand 955-959 ft., T.D. 959 ft.

Dayton, Phillips County: Carter Oil 2 Anna Schulz, NE SE 26-2s-19w, 150 bbl. oil and 100 bbl. water, 6,000 gal. acid, Lansing 3,217 ft., T.D. 3,413 ft.

Deichman, Cowley County: Trees Oil 1 Miller, SE SE NE 23-31s-4e, 143 bbl., 50-qt. shot 2,930-63 ft., Bartlesville sand 2,860 ft., pay 2,860-2,962 ft., T.D. 2,963 ft.

Erway, Rooks County: Cities Service 1 Grossbeck, S½ SE SW 1-10s-16w, dry at 3,359 ft., Topeka 2,807 ft., Dodge 3,069 ft., Lansing 3,103 ft., base Kansas City 3,352 ft.

Frog Hollow, Cowley County: Carter Oil 1 Brothers, NE SE SW 17-32s-5e, 158 bbl., natural, Bartlesville sand 3,000 ft., pay 2,999-3,027 ft., T.D. 3,027 ft.

Henne, McPherson County: H. & M. Oil 1 Henne, NW SE 21-17s-1w, 910 bbl. natural, Mississippian 2,662 ft., pay 2,665-72 ft., T.D. 2,672 ft.

Hugoton, Haskell County: United Prod. 1 Frank Roy, NE NE SW 29-29s-34w, 16,459,000 cu. ft. gas, pay 2,548-2,748 ft., T.D. 2,748 ft.

United Prod. 1 Anthony, SW SW NE 19-29s-34w, location abandoned.

*(Continued on Page 244)*

Because . . . the exclusive design of the ABERCROMBIE PRESSURE GAUGE dampens pump pulsations over the entire pressure range, without adjustments. And the gauge is not affected by external vibrations, such as shaky derrick floors. The self-contained diaphragm prevents line fluid from entering any part of the gauge mechanism. Full details in your Composite Catalog, or write Abercrombie Pump Company, Gulf Bldg., Houston, Texas.

ABERCROMBIE
PRESSURE GAUGE

COMPLETE LINES OF PIPE LINE EQUIPMENT

DISTRIBUTORS FOR

CARDWELL PIPE BOOMS
LINK-BELT SPEEDER SHOVELS

ALSO

LARGE STOCK OF USED EQUIPMENT ON HAND AT ALL TIMES

TULSA MACHINERY CO.
Box 96 TULSA, OKLA. 2-4489

6 books for your library

Progressive oil men make use of good books about their business. Nothing quite takes the place of knowledge, and the following books are recommended highly for the particular fields for which they were written:

| | |
|---|---|
| Diesel Engineering Handbook —MORRISON | $ 6.00 |
| Elements of Diesel Engineering —ADAMS | 4.00 |
| Gas Engineer's Handbook— | 7.50 |
| Pipe Corrosion and Coating— LARSON | 1.50 |
| Piping Handbook—WALKER & CROCKEL | 6.00 |
| Done in Oil—LEVEN | 10.00 |

Extend your library of sound reading with any one or all of these books. They will be send c.o.d. if desired; otherwise, full payment should accompany your order.

*Book Department*

The Oil and Gas Journal
Tulsa, Oklahoma

CANADIAN FIELDS

# Report Increased Production From Fort Norman Area

By VICTOR LAURISTON

CHATHAM, Ont. — A noteworthy feature of this year's Canadian oil development is a substantial increase in production from the Fort Norman field in the Far North, where new drilling operations were quietly launched this spring. The field, first opened by Imperial Oil in 1919-20, is on the Mackenzie River, close to the Arctic Circle. Up to the end of 1941, some seven wells had been drilled, of which three were producers with an estimated potential output of less than 400 bbl. daily. A small refinery in the field, 53 miles below (or north of) Fort Norman, has been operated several successive summers, supplying aviation gasoline for northern planes and diesel fuel and other products for river craft and mining operations in the Great Bear region.

This spring Imperial Oil, with the backing of the federal government, sent drilling crews and equipment into the north early in the season. The only official announcement made at the time was that several new wells would probably be drilled, but there were unofficial reports of a definite program of 20 wells. In addition to drilling equipment, large quantities of pipe were moved in and a pipe line from the field to White Horse or some other point convenient to the Alaska Highway was understood to be in contemplation.

Since the crews left for the North last spring, no official information has been given out regarding the progress of drilling operations. Additional drillers from Turner Valley were taken into the field after operations had been in progress for several weeks.

Considerable excitement was aroused when the June bulletin of the federal Department of Trade and Commerce showed for that month a production of 333,494 bbl. from the Northwest Territories, compared with 534 bbl. in May and 1,198 bbl. in June 1941.

A correction just received indicates the figure given for June was erroneous. The corrected figures of production from the Northwest Territories for the current year are:

February, 129 bbl.; March, nil; April, 2 bbl.; May, 15 bbl.; June, 9,528 bbl., making a total of 9,674 bbl. for the 6 months. July production for the field is given at 7,945 bbl., compared with 5,983 bbl. for the same month last year.

### Turner Valley Production

Crude and natural-gasoline production from all Alberta fields for the week ending September 7 averaged 27,642 bbl. daily compared with 27,049 bbl. daily for the previous week and 27,683 bbl. daily for the corresponding week last year.

### To Cancel Undeveloped Leases

Announcement has been made by Hon. N. E. Tanner, minister of lands and mines for Alberta, that petroleum and natural-gas rights of lessees who failed to begin drilling by September 1 would be cancelled under an order issued August 1941. A lessee, however, will have an opportunity for a limited time to obtain a lease under existing regulations on payment of outstanding rentals and other charges and a fee; and such lessee will have until April 1, 1944, to commence drilling, or, in wildcat territory, to contribute to the cost of a well drilled in the vicinity of his holdings.

In the Taber field, southern Alberta, Standard of British Columbia-C.P.R. 76-17-B, LSD 12, 17-9-16w4, has finished a dry hole at 3,240 ft. and is being abandoned. Standard-Province 1, LSD 9, 18-9-16w4, which on preliminary tests indicated 200 to 300-bbl. flush production, has arranged to market its crude, and is on the pump for a definite production test.

In the Vermilion field, eastern Alberta, Serena 1, LSD 9, 25-50-6w4, finished at 1,836 ft., has an initial pumping production of 25 bbl. daily.

R. C. Vaughan of Montreal, president of the Canadian National Railways, has announced that his company, which is now taking a carload of fuel oil daily from the Vermilion field, could use considerably more, and is looking into the possibilities of greater development. August shipments from the field totaled 34 cars.

In the Athabaska district of northern Alberta, Athabaska Oil & Gas Syndicate has made location in LSD 14, 10-66-23w4. The syndicate holds 20,000 acres under permit. The field has been geologized by Dr. J. O. G. Sanderson of Calgary, and a gentle dome structure is indicated with prospects of low-grade crude at shallow depth. In the same general area Athadome Oils 2, LSD 3, 15-66-23w4, drilled to 2,504 ft. some 10 years ago, encountered gas flows at 1,315 and 1,677 ft., aggregating more than 2,000,000 cu. ft. daily, and in the Grand Rapids formation below 1,650 ft. a 50-ft. sand yielding around 15 bbl. of 21.1° crude.

### B. C. Test Abandoned

Hon. Herbert Anscombe, minister of mines for British Columbia, has announced the definite abandonment of the Provincial Government 1 test on Commotion Creek, in the Peace River Block, in the northern part of the province. The test was started in 1940 by the Pattullo government, after extensive geological investigations, the government having withdrawn the acreage from private leasing with a view to handling the oil development as a government monopoly. Last year drilling was halted around 5,500 ft. and a survey was made by Dr. G. S. Hume of the Geological Survey of Canada, who advised, in view of the depth already attained, that drilling be continued for an additional 1,000 ft. The well was carried to 6,909 ft. without securing any production. A further examination was then made by Dr. Hume, who reported: "There can be no doubt that the well on the lower horizons is below the same horizon on the north closure, and hence it is now presumably outside any area that might reasonably be expected to be productive on the anticline. It is even though that the well is now lower on the deeper horizons than the elevation of these same horizons in the syncline to the west of the Commotion Creek anticline. This is additional evidence to me that the well now has no further prospects at depth. The fact that no gas or oil shows have occurred in the well thus becomes significant, even though the Bullhead formation which is now being drilled is admittedly extremely hard and tight." Drilled in isolated wildcat territory the well cost over $600,000.


INTERLOCKED is One Rod Packing that

Can't Come Apart

J-M INTERLOCKED—*the greatest single improvement ever made in braided packing*

Once Interlocked is installed, you can be sure that repacking jobs will be few and far between. This unique braided material has no jackets to wear through or come apart . . . no plaits to loosen. It is braided square, and thus presents a better contacting area . . . provides a tight seal with minimum gland pressure.

For details, write for Catalog PK-12A. Johns-Manville, 22 E. 40th St., New York.

J-M Interlocked is available for prompt delivery . . . See your nearest J-M Distributor

JM Johns-Manville PACKINGS & GASKETS


LEGAL

OIL AND GAS LEASE

United States Department of Agriculture, Forest Service, Jackson, Mississippi, September 17, 1942. Sealed bids in triplicate will be received until 2 P. M., Central Time, October 19, 1942, and then publicly opened, offering bonus for operating rights in connection with gas and oil leases on nine parcels of national forest land located in Township 7 North, Range 5 East, Sections 3, 4, 9, 15, 17, 21 and 22 in Franklin County, Mississippi, and in Township 8 North, Range 5 East, Section 34 in Lincoln County, Mississippi, containing in all approximately 1160 acres. Award of lease will be made only to bidder who can show sufficient experience and financial resources and prove citizenship. Interested parties may obtain bid documents, lease forms and operating regulations from the Forest Supervisor, Masonic Building, U. S. Forest Service, Jackson, Mississippi.

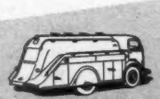
# BUTLER BUILDS *Complete* Airports

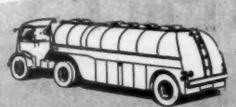
1 Steel Runways. 2 Camouflage
Design Hangers. 3 Dymaxion Houses.
4 Military Quarters. 5 Machine Shops.
6 Warehouses. 7 Refueling Units.

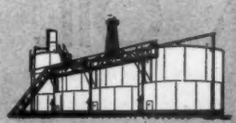
## *for today's wings of* Victory *and tomorrow's ports of Peace*

American war birds are taking wing—flight after flight—in swarms they are heading to destinations at every point of the compass. Ahead of them are going air warports—the kind that only American ingenuity can quickly engineer, then as quickly produce. These airports are complete to afford most every facility and are designed for compact shipment and speedy installation. This also means that they are readily dismantled and reinstalled. Butler engineers and craftsmen with war-sharpened skill and augmented factory facilities are making, for today's wings of Victory, complete warports which will excel as the peace ports of tomorrow.

OUT OF OUR WAR PRODUCTION WILL COME EVEN BETTER BUTLER PRODUCTS FOR PEACE


GASOLINE DELIVERY TANKS


HIGHWAY TRANSPORT TANKS


OIL FIELD TANKS

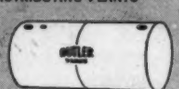
OIL DISTRIBUTING PLANTS

PREFABRICATED STEEL FACTORY BUILDINGS

PREFABRICATED MACHINE SHOPS

MODERNISTIC PANEL-STEEL SERVICE BUILDINGS

BUTANE GAS SYSTEMS


UNDERGROUND TANKS

**BUTLER MANUFACTURING COMPANY**
**1244 EASTERN AVE., KANSAS CITY, MO.**

Sales Offices: Kansas City, Minneapolis, Washington, New York, Chicago, Atlanta, Shreveport and Houston

*Representatives In Other Principal Cities*

Export Office: 8 South Michigan, Chicago, Illinois

# Prospective Pool Openers Prove Disappointing

SHREVEPORT, La.—Amerada 1 S. S. Turbeville, located in 4-18s-12w, Union County, Arkansas, which is attempting to open production in the Travis Peak, reperforated casing at 3,150-56 ft., and is showing salt water with a scum of oil while swabbing. This is the second test to be made, a previous test having shown the same results at 3,215-24 ft., and little hope is now held that the well will be successfully completed. Total depth is 6,290 ft., and casing was cemented for testing after side-wall cores showed possible production.

Carter 1 Lena E. Orr, the discovery well of a new Smackover lime field near the city of Texarkana in Miller County is still testing and no potential gage has been made. The well continues to flow at the rate of 68 bbl. of distillate daily through ⅛-in. choke with tubing pressure 2,600 lb.

### ARKANSAS COMPLETIONS

#### Wildcats

Columbia County: Sinclair Prairie 1 F. W. Souter, NE SW 15-17s-22w, dry at 8,586 ft., Cotton Valley 6,260 ft., Buckner 8,229 ft., Smackover 8,388 ft.

Miller County: Carter 1 L. E. Orr, SE NW 3-16s-28w, 61 bbl. 71.3-gravity distillate and 1,800,000 cu. ft. gas in 14 hr., perf. 7,348-7,405 ft., Smackover porosity 7,348-59 ft., T.D. 7,700 ft.

Ouachita County: Joe Bander 1 A. V. Bragg, SE SE 31-13s-17w, dry at 2,510 ft., Midway 830 ft., Annona 1,820 ft.

#### Fields

Dorcheat, Columbia County: R. A. Rolland et al 1 Roberts & Murphy, S½ NE 15-18s-22w, 168 bbl., ¼-in. choke, perf. 7,883-91 ft., 8,930-36 ft., 8,918-22 ft., Smackover 8,848 ft., porosity 8,863 ft., T.D. 9,000 ft.

Macedonia, Columbia County: Magnolia B-1 Willis unit, S½ SW 17-18s-21w, 217 bbl., ¼-in. choke, Smackover 8,875 ft., porosity 8,884 ft., T.D. 8,961 ft.

Midway, Lafayette County: Arkansas Fuel Oil 1 C. P. Creek, SE NE 9-15s-24w, 11 bbl. per hr., ¼-in. choke, perf. 6,420-45 ft., Smackover 6,412 ft., porosity 6,420 ft., T.D. 6,474 ft.

Barnsdall A-5 McLain et al, N½ S½ NE NE 13-15s-24w, 18 bbl. per hr, ¼-in. choke, Smackover porosity 6,423 ft., T.D. 6,465 ft.

### NORTH LOUISIANA

Glenrose Gasoline Co. 1 Stiles, located in the old Caddo field, Caddo Parish, is expected to be abandoned following two disappointing production tests. With the hole bottomed at 5,400 ft., the well tested dry through casing perforations in the Pettit at 5,000-30 ft., while at 4,346-66 ft. the recovery was five stands of slightly gas-cut mud.

With the drilling up of the Haynesville field in Claiborne Parish, activity has subsided. Last week eight permits were issued for new wells of which three were wildcats, the field wells were in West Vivian, Haynesville, Homer, Lake St. John, and Nebo.

#### NORTH LOUISIANA COMPLETIONS

Wildcats, Madison Parish: Continental 1 Patterson, 7-16n-12e, dry at 3,043 ft.

Catahoula Lake, La Salle Parish: Carter et al C-2 Catahoula Lake, NW SE 6-6n-4e, 449 bbl., 7/32-in. choke, perf. 4,090-94 ft., oil sand 4,091-98 ft., T.D. 4,802 ft.

Haynesville, Claiborne Parish: Midstates Oil Co. 1 F. T. Goree, NE NW 27-23n-8w, 450 bbl., ⅜-in. choke, perf. 5,412-28 ft., 5,433-39 ft., 5,485-90 ft., 5,000 gal. acid, Pettit porosity 5,412-28 ft., 5,433-39 ft., 5,487-90 ft., T.D. 5,514 ft.

T. L. James & Co. et al 1 Williamson-Lewis, NE NE 28-23n-8w, 528 bbl. in 19 hr., 47/64-in choke, Pettit porosity 5,466-83 ft., 5,533-42 ft., perf., 5,000 gal. acid, T.D. 5,625 ft.

Nebo, La Salle Parish: Placid Oil Co. 1 J. W. Moffett, NE SW NW NE 27-7n-3e, dry at 4,146 ft.

Sligo, Bossier Parish: Triangle Drlg. B-5 Murff, E½ W½ SE NE 19-17n-11w, pumped 56 bbl., 2,500 gal. acid, porous lime 3,158-60 ft., T.D. 3,176 ft.

Vivian, Caddo Parish: Sloan Wells 1 Thigpen-Herold, NW NE SW 35-22n-16w, dry at 2,504 ft.

### MISSISSIPPI

Marco Drilling Co. 1 Long-Bell Lumber Co., 10-2n-10e, Clarke County, Mississippi, has been abandoned due to mechanical trouble. This well is reported to have logged saturated sand at 3,686 ft., and casing was cemented for testing. However, the results were disappointing and in attempting to drill by 1,400 ft. of 4-in. casing, the drill stem became stuck and the hole was junked. Due to the showings logged, additional development is expected to be started within the near future.

Still Available

TULSA OIL THIEFS

No Advance in Price

Prompt Delivery

W. L. WALKER CO.

1009 S. Main Tulsa, Oklahoma

## California Fields

*(Continued from Page 228)*

extend over into the west end of the Del Valle structure. This region is quite broken up and although the area intervening between San Martinez and Del Valle is distorted subsurface conditions may be more flat.

#### COASTAL DISTRICT COMPLETIONS

Oak Canyon, Los Angeles County: Western Gulf Oil Co. 2 U. S. Gilmour, 32-5n-17w, flowed 576 bbl., 34.4-gravity, 0.2 per cent cut, 250,000 cu. ft. gas, 18/64-in. bean, pressures 420/700 lb., T.D. 7,112 ft., gun-perf. 7,030-80 ft., completed in lower zone of Miocene age, oil sand 7,025-80 ft., gray sand 7,085-7,112 ft.

### Location Made for Third Buena Park Well

Texas Co. has made tentative location for a new well to be drilled between 1 Spencer, the discovery well in the Buena Park field of Orange County, and 4-1-E Buena Park, but final decision will not be made for another several days. The latter well, which is located rather far down the structure, proved to be the better of the two completions to date as it is at present making 310 bbl. of 23.1-gravity oil cutting 4 per cent daily. The highest well structurally was located east of 1 Spencer, but proved a duster as far as commercial production is concerned, as it did not have enough oil sand to show a sustained production.

The War Production Board cracked down on two California operators this week and both have been ordered to shut in their two offending wells for the next 60 days. The operators in question are Chester F. Dolley and H. S. Kohlbush, and both are charged with using critical materials to drill wells that fail to conform with the mandatory well spacing of 1 well to 40 acres. Kohlbush's well is located in the Huntington Beach field and Dolley's project is in the Torrance field. This is the second time that it has been necessary to invoke war measures because of violation of provisions of M-68, the first violation being charged against an operator in the Santa Maria Valley field several months ago. This violation in the coastal district was for overproducing and failing to conform with established allotments. The Los Angeles city council, which has been considering several drilling areas, has ordered an ordinance drafted to create another district in the Wilmington field where drilling operations may be undertaken. The proposed section of the field will be bounded by Pacific Coast Highway, Frigate Avenue, McDonald Avenue and L Street. This area is adjacent to acreage already under production and merely broadens the area in which development work may proceed. The district is outside the section of the Wilmington field underlain by the Terminal or Ford zones and production will therefore come from the Ranger zone, which extends over into the Torrance field.

#### LOS ANGELES BASIN COMPLETIONS

Brea Olinda, Orange County: Union Oil Co. 73 Stearns, 7-3s-9w, pumped 322 bbl., 24.6-gravity, 25 per cent cut, T.D. 4,309 ft., P.B. 3,810 ft., perf. 3,455-3,808 ft., completed in Brea Olinda zone of Pliocene age, lower part of hole tested wet.

Huntington Beach wildcat district, Orange County: La Bolsa Rancho syndicate 1 H. B., 22-5s-11w, dry, T.D. 7,310 ft.

Rio Hondo wildcat district, Los Angeles County: Potrero Oil Co. 1 Neuman, 32-1s-11w, dry, T.D. 5,429 ft.

Torrance, Los Angeles County: Texas Co. 7 Oakley, 30-4s-13w, pumped 65 bbl., 16.2-gravity, 35 per cent cut, T.D. 3,692 ft., perf. 3,189-94 ft., 3,199-3,315 ft., 3,450-3,665 ft., completed in Ranger zone in Harbor City section of Torrance field west of the Wilmington field.

# Franklin County Wildcat Nears Smackover Lime

By ROBERT INGRAM

DALLAS, Tex.—Wildcatting activity in East Texas spurted forward last week as both major companies and independents staked locations for new tests throughout the area. Meanwhile, critical depth has been reached by J. B. White et al 1 Jackson, deep wildcat on the Talco fault, in Franklin County. This test topped dense lime at 8,120 ft., which was first thought to be the Smackover lime, but as hole was cored and drilled ahead to 8,343 ft., formation at that point was determined as the Buckner horizon, with the Smackover objective expected within the next 100 ft. or so. This well cut the fault at approximately 7,500 ft., showing about 1,400-ft. displacement, and is very high regionally. Its outcome will have a big bearing on future exploration for the Smackover lime along the Balcones fault system in East Texas.

Humble Oil & Refining Co.'s deep discovery at Larissa in northern Cherokee County continues testing around 60 to 80 bbl. of 47.8-gravity oil daily through ¾-in. choke from perforations at 10,160-10,212 ft. in the Pettit lime. Magnolia 1 Braly, deep test just east of Mount Selman, same county, is drilling at 6,885 ft. in shale after topping Paluxy with no shows at 6,010 ft.

In Wood County, Delta Drilling Co. spudded and set surface pipe at 1 Goldsmith, projected deep test on a Shell farmed-out geophysical block northwest of Quitman. Amerada has five rigs working in the Coke field and has staked location for a sixth operation at 1 J. D. Kennemer on north edge of the area. Jerry Hawkins' 3 Clark, northeast edge test at Coke, made 50 bbl. hourly from perforations at 6,330-68 ft. General American Oil Corp.'s 1 Skeen, southwest edge test, is having difficulty in completing, due to bad cementing jobs around casing, but is high enough to assure a well if the mechanical trouble can be overcome.

Lone Star Gas Co. and Delta Drilling Co. are moving in materials for a Travis Peak wildcat southwest of Athens, Henderson County, on a Sinclair Prairie company farmout block. Magnolia Petroleum Co. is starting its 2 Campbell, 1,320 ft. northeast of the low-gravity Woodbine discovery well at Concord School, in Anderson County. In Kaufman County, Martin & Milton have made location for a 3,000-ft. Woodbine test at 1 Ruthland Savings Bank, 3 miles southeast of Kemp. A new Woodbine wildcat in northwestern Upshur County is Three C's Oil & Gas Co. 1 J. I. Blount, in the J. Trimble Survey. Humble Oil & Refining Co. is starting a lower Glen Rose wildcat east of Center in Shelby County, at 1 R. C. Adams.

Sinclair Prairie Oil 1 Swinney, which has extended the Chapel Hill field, Smith County, 2 miles southward, after acidizing the Pettit lime through perforations between 8,150-8,260 ft., makes 30 to 40 bbl. daily of 40-gravity oil, on gas lift. The company is making arrangements to drill several other tests nearby.

Two Houston County tests are reported drilling ahead in a search for Wilcox and Woodbine production, respectively. In the Percilla area, Grimes 1 Ellis, Daly Survey, is in chalk at 4,770 ft. and is reported checking favorably. M. G. M. 2 Lundy, John Forbes League, is coring sand below 3,200 ft. at which level No. 1 found the pay about ¼ mile northeast.

## EAST TEXAS COMPLETIONS

### Wildcats

Cass County: Hollingsworth 1 Benefield & Singleton, James Wanhop Sur., dry, T.D. 5,870 ft.

Harrison County: First National Petroleum Trust Co. 1 M. G. Armstrong, Simpson Halloway Sur., flowed 46 bbl. through ¼-in. tubing choke, T.D. 6,490 ft.

Sabine County: Coastal Ref. 1 Temple Lbr. Co., R. J. Cloud Sur., dry, T.D. 4,857 ft.

### Fields

Chapel Hill, Smith County: C. R. Starnes 1 M. Spencer, L. H. Dillard Sur., 168 bbl. through ⅛-in. choke, C.P. 1,050 lb., Pecan Gap 2,835 ft., Austin chalk 3,775-3,912 ft., Woodbine 3,960 ft., Georgetown lime 4,395 ft., base Goodland 5,595 ft., Paluxy gas 5,810 ft., Glen Rose 5,893 ft., top of first anhydrite 6,640 ft., top of massive anhydrite 7,230-7,477 ft., Pettit 8,135 ft., Travis Peak 8,375 ft., T.D. 8,385 ft.

Club Lake, Hunt County: L. A. Grelling and D. F. Hughes A-2 G. Graham, Charles Hunt Sur., flowed 105 bbl. through ¼-in. choke, T.D. 2,801 ft.

Coke, Wood County: Magnolia B-1 Robinson, Jos. Knight Sur., potential 156.75 bbl. through ¼-in. choke, T.D. 6,340 ft.

Magnolia 1 Robinson, D. L. Townsend Sur., dry, T.D. 6,442 ft.

Hawkins, Wood County: Humble 6 F. K. Williams, B. N. Hampton Sur., 78.91 bbl. through ¼-in. choke, perf. 4,794-4,803 ft., T.D. 4,874 ft.

Opelika, Henderson County: Lone Star Gas et al 1 Frank Henderson, Adrian Anglin Sur., 79,000,000 cu. ft. gas a day, with 55 to 60 bbl. to 1,000,000 cu. ft. gas, T.D. 8,717 ft.

Powell, Navarro County: Gamble & Lancaster 1 W. S. Price, F. Phifer Sur., dry, T.D. 2,034 ft.


# Natural Gas Is Where You Find It

**Behind the natural gas service that industry on the Texas Gulf Coast takes for granted, lies many unseen and unheralded operations. Gas is where you find it, and finding it is the job of the geologist. It is a far cry from the day of the "wiggle sticks" and the "divining rod," to the scientific exploration for oil and gas prospects today. The science of geology embraces use of the torsion balance, the gravity meter, the magnetometer, the seismograph, and geochemical analyses in the attempt to locate a *geological prospect*, where oil or gas might be found, and it is still an uncertainty, scientific though it may be. Our geologists are at work constantly, seeking out these geological prospects, and on the judgment of these technicians hinges the all important work of leasing land for natural gas exploration by drilling, adding to the company's already large reserves that are ample for many years to come.**

**Industry located on the Texas Gulf Coast has so many natural advantages—availability of raw materials, natural gas for fuel, as well as raw product, native-born labor, mild climate, unexcelled transportation facilities. The stimulation of war production has accelerated the industrialization of the Texas Gulf Coast country; production of war goods in this area has been the talk of the nation. Post-war expansion will be rapid, and many companies are now assimilating the facts upon which to make a decision regarding location of a new post-war plant. Our research department will be glad to furnish facts and figures on this region's resources and advantages, and engineered survey industrialized to your company's products and processes. Just write Research Department, Houston Pipe Line Company, Petroleum Building, Houston, Texas, without obligating your company in any way.**

**For Victory Buy United States War Savings Bonds**

HOUSTON PIPE LINE CO.
Subsidiary of Houston Oil Company of Texas
Wholesalers of Natural GAS

# Sub-Trenton Test on Cincinnati Arch Abandoned in Deep Sand

ZANESVILLE, Ohio.—The prospects of sub-Trenton production in southwestern Ohio received a setback with Ohio 1 Harry Bishop a failure. The test is located 10 miles east of Tiffin in Seneca County, Scipio Township, Section 13. A partial log places the Clinton at 999-1,020 ft. dry, Trenton 2,056-2,636 ft., green sand 2,636-66 ft., small show of oil and gas and considerable water; more water was found in a sandstone at 3,060 ft. Drilling was stopped at 3,124 ft. The elevation of the test is 908 ft.

A small gasser marks the second successful Oriskany test in the Birds Run area northeast of the old Cambridge field in Guernsey County. The Ohio Fuel 1 L. H. Jackson, Section 16, Wheeling Township, made 112,000 cu. ft. gas from the Oriskany at 3,463-70 ft. The sand was very hard. Eleven hours after shot the well shut in at 680,000 cu. ft. The top of the Corniferous lime was logged at 3,302 ft.

### OHIO COMPLETIONS

Ashland County, Lake Township: Lyons Co. 1 L. Krebs, Sec. 15, 320,000 cu. ft. gas, shot, Clinton T.D. 2,862 ft.

Sullivan Township: Ohio Fuel Gas 1 Aetna Life Ins. Co., Lot 27, dry, Clinton sand absent, T.D. 2,779 ft.

Belmont County, Somerset Township: Permian O. & G. Co. 1 E. J. Pfeffer, Sec. 34, 60,000 cu. ft. gas, shot, Berea, T.D. 1,755 ft.

Holmes County, Richland Township: Ohio Fuel 1 J. L. Gray, Sec. 5, dry, Clinton, T.D. 3,332 ft.

Knox County, Jackson Township: Preston Oil 1 Ray Earlywine, Sec. 8, show of oil, plugged, Clinton, T.D. 3,042 ft

Lawrence County, Union Township: Pawnee Corp. 1 S. C. Holliday, Sec. 4, 100,000 cu. ft. gas, shot, Ohio shales, T. D. 2,952 ft.

Lorain County, Ridgeville Township: Edson & Son 1 Peter Sznte, Lot 41, dry, Clinton, T.D. 2,428 ft.

Meigs County, Bedford Township: Ohio Fuel 1 A. J. Helwig, Sec. 30, 190,000 cu. ft. gas, second Berea, T.D. 1,654 ft.

Rutland Township: Ohio Fuel 1 Bert Campbell, Sec. 27, 360,000 cu. ft. gas, Mackburg and Maxon sands, T.D. 863 ft.

Medina County, Hinckley Township: Ohio Fuel 1 Fred Damon, Sec. 33, 2,100,000 cu. ft gas, shot, Clinton, T.D. 3,565 ft.

Monroe County, Adams Township: Monroe Oil Co. 1 G. Kemp, Sec 18, dry, Stray, T.D. 1,500 ft.

Franklin Township: Quail Run Oil Co. 1 E. McConnell, Sec. 6, dry, Squaw, T.D. 1,557 ft.

Morgan County, York Township: Swingle 1 Chas. Bush, Sec. 25, 200,000 cu. ft. gas, Berea, T.D. 1,181 ft.

Marion Township: Bern Oil & Gas 1 W. Bowman, Lot 36, 575,000 cu. ft. gas, Salt sand, T.D. 942 ft.

Noble County, Enoch Township: Felix Gerst 1 J. W. Weisant, Sec. 21, 120,000 cu. ft. gas, Berea, T.D. 1,529 ft.

Perry County, Madison Township: Preston Oil 2 Jacob Keifer, Sec. 4, show oil, plugged, Clinton 3,346-96 ft., T.D. 3,409 ft.

Summit County, Bath Township: Wiser Oil Co. 1 G. H. Doolittle, Lot 54, show gas, plugged, Clinton, T.D. 3,572 ft.

Wayne County, Congress Township: Ohio Fuel 1 Wade Ewing, Sec. 34, dry, Clinton, T.D. 3,202 ft.

Washington County, Fearing Township: Chas. Wirth 6 Jacob Morgenstern, Sec. 10, 10,000 cu. ft. gas, first Cow Run, T.D. 688 ft.

## INDIANA

EVANSVILLE, Ind.—Sells Petroleum, Inc., has set casing to test the Waltersburg sand in the 1-A McCarty unit, SW NE NW 32-6s-11w, about 2 miles southwest of Evansville. Operators only drilled 4 ft. of sand and then set pipe. The sand was encountered at 1,737-41½ ft. and all indications are leading operators to believe that the well is a little higher structurally than the first well in the area. On a 50-minute drill-stem test 90 ft. of clean oil was recovered.

Operators are now moving in material to drill the 2 A. J. McCarty unit, SE NW NW 32-6s-11w, a north offset to the discovery well, 1 McCarty, NE SW NW 32-6s-11w, completed in the Waltersburg sand in February of this year.

In Spencer County, E. & R. Petroleum is planning to drill two wells on a tract in NE NE 2-8s-7w, about 5 miles southwest of Rockport. The tract is about 1½ miles southeast of the Miller & Shiarella 1 Ruth Locker which was completed as a McClosky producer. In Posey County, Mathuska Oil Co. is still testing the Cypress sand at 2,463-70 ft. after a second shot of 60 qt. of nitroglycerin in the 1 Ed Holmans, NW NE NW 5-4s-14w.

### INDIANA COMPLETIONS

Daviess County: Indilliky Oil Co. 3 White, SW NE NW 28-2n-7w, pumped 45 bbl., natural, Levias 1,161-65 ft., 1,187-94 ft., T.D. 1,325 ft.

R. D. Brown, Inc. 1 A. Desser, S½ SW NE 16-2n-6w, location abandoned.

R. D. Brown, Inc. 1 Kelly heirs, NE SW 16-2n-6w, location abandoned.

Gibson County: R. D. Brown, Inc. 1 R. H. Mahan, SW NW SW 36-1s-10w, dry at 1,418 ft., Glen Dean 1,328 ft., Hardinsburg 1,355 ft.

R. D. Brown, Inc. 1 fee, SW SE NE 35-1s-10w, location abandoned.

Spencer County: A. D. Vickers 1 Kennedy, NE NE NW 34-6s-5w, location abandoned.

Vickers & Leeper 1 Kennedy, NE NW NW 34-6s-5w, pumped 50 bbl., 40-qt. shot 983-92 ft., Aux Vases 980 ft., T.D. 994 ft.

Sullivan County: Ohio Oil Co. 1 C. M. Walters B, SW SE 3-8n-10w, pumped 16 bbl. oil and 16 bbl. water, 5,000 gal. acid, Devonian 2,271 ft., pay 2,384-2,406 ft., T.D. 2,407 ft.

Vanderburg County: R. L. Bauman 1 Peoples, NE SE NW 31-6s-11w, dry at 1,802 ft., Waltersburg 1,774 ft.

## EASTERN KENTUCKY

ASHLAND, Ky.—The Kentucky-West Virginia Gsa Co. has completed three wells as follows (all open flow):

### EASTERN KENTUCKY COMPLETIONS

Pike County: Kentucky-West Virginia Gas Co. 681 Hope D. Wellman, Red Brush Branch of Levisa Fork, T.D. 3,795 ft., shale, 440,000 cu. ft. gas.

Floyd County: Kentucky-West Virginia Gas Co. 693 J. H. Keathley et al, Branham Creek, T.D. 3,146 ft., shale, 298,000 cu. ft. gas.

Kentucky-West Virginia Gas Co. 696 J. M. Taylor, Big Branch, T.D. 3,020 ft., shale 3,020 ft., 353,000 cu. ft. gas.

## Illinois Fields

*(Continued from Page 226)*

31-5s-7e, dry at 3,220 ft., Weller 2,720 ft., Paint Creek sand 2,925 ft., Aux Vases sand 3,030 ft., Ste. Genevieve 3,063 ft., McClosky 3,193 ft.

Texas 5-B Hall, NW SE SE 18-6s-7e, flowed 412 bbl., 20-qt. shot 3,036-56 ft., Aux Vases sand 3,022 ft., T.D. 3,056 ft.

East Centralia, Marion County: Markham Drlg. 3 Leonard, SW NW NW 16-1n-1e, pumped 5 bbl., 20-qt. shot 1,629-39 ft., Weller 1,628-40 ft., 1,654-68 ft., T.D. 1,668 ft., P.B. 1,639 ft.

Markham Drlg. 2 Edwards, NW NE NE 17-1n-1e, dry at 1,970 ft., Glen Dean 1,438 ft., Golconda 1,510 ft., Barlow 1,598 ft., Paint Creek 1,741 ft., Benoist 1,768 ft.

East St. Francesville, Lawrence County: Sinclair and Bower 7 Allstates Life, NE NE SW 22-2n-11w, pumped 15 bbl., 10-qt. shot 1,766-72 ft., 20-qt. shot 1,766-70 ft., Benoist 1,754 ft., T.D. 1,772 ft.

Keensburg, Wabash County: Navajo Oil 3 Gray, NE NE SE 30-2s-13w, dry at 2,483 ft., Barlow 2,437 ft.

Louden, Fayette County: Carter 3-D Tucker, NE NW 27-8n-3e, flowed 44 bbl. oil and 96 bbl. water, natural, Devonian 3,040 ft., pay 3,124-37 ft., T.D. 3,127 ft.

Carter 2 Black, SE NE NE 1-8n-3e, pumped 37 bbl., 20-qt. shot 1,535-40 ft., Weller 1,536 ft., T.D. 1,547 ft.

Carter 2 Bank, NW NE SE 3-8n-3e, flowed 250 bbl., 40-qt. shot 1,551-64 ft., 20-qt. shot 1,454-74 ft., Benoist 1,550 ft., Weller 1,449-85 ft., T.D. 1,582 ft.

Mt. Carmel, Wabash County: Texas 1 W. P. Stickler, S½ SE SW 8-1s-12w, dry at 2,477 ft., Biehl 1,522 ft., Tar Springs sand 1,745 ft., Glen Dean 1,794 ft., Golconda 1,908 ft., Barlow 1,992 ft., Cypress sand 2,010 ft., Paint Creek 2,120 ft., Benoist 2,166 ft., Renault 2,210 ft., Ste. Genevieve 2,268 ft., Rosiclare 2,308 ft., McClosky 2,342 ft.

Mt. Erie, Wayne County: Jablonski et al 1 Totten-Shelborn, SW SE 35-1n-8e, flowed 900 bbl., 3,000 gal. acid, McClosky 3,088 ft., T.D. 3,096 ft.

Pure 1 Sanlin Consol., SW NW SW 35-1n-8e, dry at 3,112 ft., Glen Dean 2,510 ft., Hardinsburg 2,557 ft., Barlow 3,690 ft., Cypress 2,702 ft., Weller 2,720 ft., Paint Creek 2,935 ft., Renault 2,965 ft., Aux Vases 2,974 ft., Ste. Genevieve 3,032 ft., McClosky 3,092 ft.

New Harmony, White County: Superior 1-E H. C. Ford, NE NE NE 34-4s-14w, pumped 73 bbl., 60-qt. shot 2,831-44 ft., Aux Vases 2,828 ft., T.D. 2,930 ft.

North Benton, Franklin County: Central P. L. 1 Kirk & Isaacs, SE NW NW 1-6s-2e, pumped 165 bbl., natural, Paint Creek sand 2,573 ft., T.D. 2,598 ft.

St. Jacob, Madison County: Obhering et al 1 F. Meyer, SW SW SW 15-3n-6w, pumped 140 bbl., 8,000 gal. acid, Trenton 2,355 ft., T.D. 2,386 ft.

Bryant et al 2 Rhein, SW SE SW 16-3n-6w, pumped 240 bbl., 3,000 gal. acid, Trenton 2,333 ft., T.D. 2,364 ft.

Ohio 2 Hartman, SW SW NE 21-3n-6w, location abandoned.

St. Paul, Fayette County: Luttrell et al 2-A Aukamp, SE NW NE 31-5n-3e, pumped 65 bbl. oil and 75 bbl. water, 10-qt. shot 1,900-9 ft., Benoist 1,889 ft., T.D. 1,910 ft.

Sims, Wayne County: Texas 2 J. D. Jones, W½ SW NW 34-1s-6e, pumped 278 bbl., 2,000 gal. acid, McClosky 3,202 ft., T.D. 3,220 ft.

South Lawrence County: Moindia Oil Co. 2 Hershey, NW SE SE 27-2n-12w, pumped 20 bbl. oil and 40 bbl. water, 280-qt. shot 1,998-2,021 ft., Benoist 1,986 ft., T.D. 2,021 ft.

South Sailor Springs, Clay County: McBride 1 L. Hagan, SE NW SE 3-3n-7e, dry at 3,015 ft., Menard 2,203 ft., Tar Springs 2,330 ft., Glen Dean 2,414 ft., Cypress 2,580 ft., Aux Vases 2,843 ft., Ste. Genevieve 2,906 ft., Rosiclare 2,930 ft., Fredonia 2,938 ft., McClosky 2,943 ft.

McBride 1 Harrison-Hagen, SE NE NW 3-3n-7e, pumped 34 bbl. oil and 9 bbl. water, 5-qt. shot 2,601-5 ft., Cypress sand 2,597-2,608 ft., T.D. 2,608 ft.

Walpole, Hamilton County: Texas 1 M. E. Smith, SW NW SW 35-6s-6e, dry at 3,165 ft., Tar Springs 2,406 ft., Glen Dean 2,550 ft., Golconda 2,664 ft., Barlow 2,780 ft., Weller 2,864 ft., Benoist 3,027 ft., Renault 3,094 ft., Aux Vases sand 3,116 ft., Ste. Genevieve 3,159 ft.

## Texas Gulf Coast

*(Continued from Page 230)*

Stanolind 1 Stouten Borough, 3,696,000 cu. ft gas, ¼-in. choke, top gas sand 6,534 ft., T.D. 7,315 ft.

Stanolind 1 James & Campbell, 3,757,000 cu. ft. gas, ¼-in. choke, top gas sand 6,426 ft., T.D. 7,313 ft.

Mercy, San Jacinto County: Atlantic 1 Beschell, dry. T.D. 8,317 ft.

Seabreeze, Chambers County: Sun 1 Granat-Hoffman, 175 bbl., ⅛-in. choke, perf. 8,510-45 ft., T.D. 8,565 ft.

Stewart, Jackson County: W. S. Boyle 1 Copsey, 43 bbl., ⅛-in. choke, perf. 4,984-92 ft., T.D. 5,050 ft.

W. S. Boyle 1 Meyer, 17 bbl. oil plus 3 per cent salt water, 9/64-in. choke, perf. 4,960-72 ft., T.D. 5,050 ft.

Texana, Jackson County: Houston 1 Clements, 49,000,000 cu ft. gas, open tubing, perf. 5,560-71 ft., T.D. 5,726 ft.

West Mauritz, Jackson County: J. B. Coffee 1-C Mauritz. 107 bbl., 7/64-in. choke, perf. 5,479-82 ft., T.D. 5,660 ft.

## Kansas Fields

*(Continued from Page 239)*

Kipp, Stafford County: Skelly 1 T. A. Toland, 8½ NE NW 27-25s-14w, dry at 3,906 ft., Lansing 3,712 ft.

Kraft-Prusa, Barton County: Ramsey Pet. 1 Onna Solken, SW SW 22-17s-11w, 996 bbl., 8,000 gal. acid, Lansing 3,075 ft., pay 3,160-70 ft., T.D. 3,338 ft., P.B. 3,180 ft.

Skelly 1 A. Heller, NE NE SE 22-17s-11w, 1,815 bbl., 3,000 gal. acid, Arbuckle 3,278 ft., pay 3,278½-94 ft., T.D. 3,294 ft.

Skelly Oil 1 O. Socken, NE NE SW 22-17s-11w, 156 bbl., 4,750 gal. acid, Arbuckle 3,270 ft., pay 3,271-86 ft., T.D. 3,286 ft.

Lindsborg, McPherson County: M & L Oil 1 Baker, W½ SW SE 18-17s-3w, 159 bbl., 5,500 gal. acid, Viola 3,356 ft., pay 3,356-60½ ft., T.D. 3,362 ft., P.B. 3,360½ ft.

Carter Oil 1 Rasmusson, W½ NW SE 18-17s-3w, 590 bbl., 4,000 gal. acid, Viola 3,357 ft., pay 3,358-61 ft., T.D. 3,361 ft.

Carter Oil 2 E. Fornberg, W½ SE SW 18-17s-3w, 277 bbl., 6,500 gal. acid, Viola 3,362 ft., pay 3,362-67 ft., T.D. 3,367 ft.

Carter Oil 1 E. Fornberg, W½ NE SW 18-17s-3w, 414 bbl., 8,000 gal. acid, Viola 3,367 ft., pay 3,367½-69½ ft., T.D. 3,369½ ft.

Auto Ordnance Corp. 1 Sandell, W½ SE NE 8-17s-3w, 2,312 bbl., natural, Simpson sand 3,449 ft., pay 3,441-57 ft., T.D. 3,457 ft.

M & L Oil 2 Gustafson, NE SW 7-17s-3w, 794 bbl., 5,000 gal. acid, Viola 3,387 ft., pay 3,390-93 ft., T.D. 3,392 ft.

Orth, Rice County: Transwestern et al 1 Schultz, W½ SE NW 22-18s-10w, 261 bbl., 2,000 gal. acid, Arbuckle 3,229 ft., pay 3,233-54 ft., T.D. 3,254 ft.

Peace Creek, Reno County: Cities Service 4 Heylmun

B, SW NE NW 12-23s-10w, 3,000 bbl., 500 gal. acid, Viola 3,743 ft., pay 3,745-51 ft., T.D. 3,751 ft.

Cities Service 1 Keesling, NE SW 1-23s-10w, 3,000 bbl., natural, Viola 3,711 ft., pay 3,711-17 ft., T.D. 3,717 ft.

Smyres, Rice County: Continental 3 Wm. John, NE NW NW 36-19s-6w, 420 bbl., natural, Mississippian 3,292 ft., pay 3,295-3,334 ft., T.D. 3,334 ft.

R. S. Shade and R. G. Berry 1 Anderson, NE SW 25-19s-6w, 3,000 bbl., natural, Mississippian 3,370 ft., pay 3,373-96 ft., T.D. 3,396 ft.

Stoltenberg, Ellsworth County: Vickers Pet. 1 Kralik, NE SW 8-16s-10w, 3,000 bbl., 500 gal. acid, Arbuckle 3,298 ft., pay 3,298-3,313½ ft., T.D. 3,313½ ft.

Sun City, Barger County: Great Lakes Carbon Co. et al 2 Massey, NW SE NW 35-30s-15w, dry at 4,346 ft., Topeka 3,025 ft., Lansing 3,870 ft.

Trapp, Russell County: Pryor & Lockhart 1 E. Boxberger C, S½ SW NW 10-15s-14w, 186 bbl., natural, Arbuckle 3,245 ft., pay 3,253-58 ft., T.D. 3,258 ft.

Hartman & Blair 2 Dietz, S½ SE NW 22-15s-14w, dry at 3,382 ft., anhydrite 913 ft., Lansing 3,102 ft., Arbuckle 3,355 ft.

Isern Bros. 2 Meharg, N½ NW NE 16-15s-13w, 1,008 bbl., 2,500 gal. acid, Arbuckle 3,325 ft., pay 3,325-29 ft., T.D. 3,329 ft.

Virgil, Greenwood County: Aikman & Braden 1 Fleming, NW NE 15-24s-12e, dry at 2,200 ft., Mississippian 1,739 ft., Arbuckle 2,181½ ft.

Webster, Rooks County: W. L. Hartman 1-A Silvers, W½ SE SW NE 21-8s-19w, dry at 3,492 ft., Topeka 2,914 ft., Lansing 3,207 ft., Arbuckle 3,483 ft.

## Southwest Texas

*(Continued from Page 234)*

mented for testing in Texas 2 fee. Saturation was cored in the regular Pettus field pay and casing was cemented on bottom at 3,027 ft.

In the Balcones fault-line area and located 1½ miles southwest of the town of Vickers, Atascosa County, Humble Oil & Refining Co. was coring ahead in chalk below 7,372 ft. following a drill-stem test at 7,434-58 ft., which recovered mud with no showing of oil. The well is expected to be drilled to the Edwards lime.

### SOUTHWEST TEXAS COMPLETIONS

### LOWER GULF COAST DISTRICT

**Fields**

Fagan, Refugio County: P. R. Rutherford 2-D Fagan, 19 bbl., open tubing, perf. casing 5,647-50 ft., T.D. 5,762 ft.

Odem, San Patricio County: Seaboard 4 Burrows, 149 bbl., ¼-in. choke, perf. casing 5,437-42 ft., T.D. 5,553 ft.

Seaboard 1 Compton, 100 bbl., ⅛-in. choke, top sand 5,324 ft., T.D. 6,920 ft.

Seaboard 1 Asenbodo, 135 bbl., ⅛-in. choke, top sand 5,437 ft., T.D. 5,448 ft.

Seeligson, Jim Wells County: Magnolia 31 Seeligson, 178 bbl., 7/64-in. choke, perf. 5,988-90 ft., T.D. 6,050 ft.

South Caesar, Bee County: Atlantic-Transwestern 2 Cotton, dry, T.D. 6,635 ft.

### LAREDO DISTRICT

**Wildcats**

Duval County: Newman Brothers 1 Gruy, dry, T.D. 4,503 ft.

Hidalgo County: Baldridge & King 1 Daskam, dry, T.D. 6,012 ft.

Live Oak County: Moore Development Co. 1 Doebbler, dry, T.D. 2,579 ft.

**Fields**

Kohler, Duval County: Republic Natural Gas Co. 1 Dinn, 5,000,000 cu. ft. gas, sand 2,478-82 ft., T.D. 2,736 ft.

Oakville, Live Oak County: Simmons 8-C Reagan, 18 bbl. oil and 20 bbl. salt water, ¼-in. choke, perf. 2,776-79 ft., T.D. 2,774 ft.

Rincon, Starr County: Continental 3-D Slick, 192 bbl. oil and 15 bbl. salt water, ⅛-in. choke, sand 3,958-80 ft., T.D. 4,161 ft.

Washburn, La Salle County: Quintana 13 South Texas Syndicate, 110 bbl., ⅛-in. choke, top sand 5,098 ft., T.D. 5,660 ft.

## Permian Basin, Panhandle

*(Continued from Page 233)*

ft., base Permian and top detrital 4,775 ft., top Ellenburger dolomite 5,250 ft., tested sulfur water 5,561-5,666 ft., dolomite, dry, T.D. 5,666 ft.

**Fields**

Pecos County, Abell Permian: Stanolind 2 Rathjen, C Lot 15, Sec. 26, Blk. 9, H.&G.N. Sur., perf. casing 3,930-50 ft., acid. 1,000 gal., flowed 188 bbl. 24 hr. through ⅛-in. tubing choke, gas-oil ratio 552 to 1, gravity 36°, T.D. 3,965 ft.

Pecos County, Abell Ordovician: Tal-Vez Oil Co. 1 Hal Burnett, 330 ft. from NW line and 990 ft. from SW line Sec. 5, Blk. 3, H.&T.C. Sur., top McKee 5,335 ft., top pay 5,340 ft., 5½-in. casing 5,369 ft., perf. casing 5,342-60 ft. with 70 shots, flowed 1,040 bbl. 24 hr., ½-in. tubing choke, T.P. 200 lb., C.P. 600 lb., gas-oil ratio 713 to 1, T.D. 5,369 ft.

Page field, Schleicher County: Cooper Gas Co. 1-D-39 Bert Page, C NE Sec. 39, Blk. L, G.H.&S.A. Sur., 3,635 ft. NW of nearest gasser, elev. 2,377 ft., top Palo Pinto 4,810 ft., top Strawn 5,280 ft., top Ellenburger 6,487 ft., tested water in Ellenburger, P.B. to 6,275 ft., perf. casing 5,305-10 ft. and 5,440-80 ft. and 5,530-90 ft., acid. 8,000 gal., 30,000,000 cu. ft. gas daily, gas-oil ratio 109,900 to 1, T.D. 7,022 ft.

### TEXAS PANHANDLE COMPLETIONS

Carson County: Cities Service 49-A Burnett, Sec. 27, Blk. 5, 33,200,000 cu. ft. gas, R.P. 352 lb., T.D. 2,590 ft.

Cities Service 7 J. W. Fields, Sec. 13, Blk. 7, location abandoned.

Dallam County: Pure Oil 1 Federal Land, Sec. 17, Blk. 7, top granite 6,860 ft., dry, T.D. 6,862½ ft.

Gray County: Cree & Hoover 1 Bell, Sec. 111, Blk. 3, potential 89 bbl., T.D. 3,188 ft.

W. D. Kelly 3 J. A. Hood, Sec. 33, Blk. 3, shot 3,014-81 ft., potential 151 bbl., T.D. 3,085 ft.

Hutchinson County: Continental Oil 7-C Sanford, Sec. 79, Blk. 46, potential 63 bbl., T.D. 2,733 ft.

The Texas Co. 12 Burnett, Sec. 127, Blk. 5, potential 144 bbl., T.D. 3,075 ft., P.B. 3,064.

Moore County: Texoma Natural 23-M Coon, Sec. 147, Blk. 44, 7,000,000 cu. ft. gas, R.P. 387 lb., T.D. 3,060 ft.

Texoma Natural 11-M Coon-Sneed, Sec. 126, Blk. T, 9,500,000 cu. ft. gas, R.P. 390 lb., T.D. 2,972 ft., P.B. 2,810 ft.

Texoma Natural 2-F W. R. Foster, Sec. 240, Blk. 3-T, 25,300,000 cu. ft. gas, R.P. 345 lb., T.D. 5,294.

## SOUTHEAST NEW MEXICO

HOBBS, N. M.—In the Lovington area, George P. Livermore 1 Maxwell-State, NW NW 26-15-34, was reported making water at 5,337-42 ft. in lime. Porous oil-stained lime was logged at 5,231-37 ft., water at 5,297 ft., and a slight showing at 5,322-27 ft. The operator plans to test the showings after deepening a few feet. Originally the well was scheduled to be a 7,000-ft. test. North of Square Lake, Premier Petroleum Corp. has located a wildcat, 1 Stahlbein, NW NE 15-16-30.

### SOUTHEAST NEW MEXICO COMPLETIONS

Square Lake, Eddy County: Flynn, Welch and Yates 1 Grier, 31-16s-31e, flowed 85 bbl., 60-qt. shot 3,000-98 ft., pay 3,080 ft., T.D. 3,170 ft., P.B. 3,098 ft.


McCORD

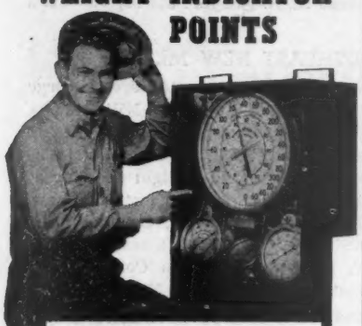
LUBRICATOR FACTS

...FOR YOUR FILES
WRITE FOR YOUR COPIES TODAY
Lubricator Facts that will help you to analyze your Lubricator Problems and determine the right Lubricator for your particular job are contained in these McCord Catalogs. If you are interested in a better Lubricator for slush pumps and drilling engines—the type "SP". If a chemical measuring pump is your problem—type "C". If you require a Lubricator for air compressors, Diesel, gasoline or steam engines—the "SF".
Write McCord Radiator & Mfg. Co., Lubricator Division, Detroit, Michigan.
McCORD
CLASS "SF" FORCE-FEED LUBRICATOR
ACCURATE • DEPENDABLE • EFFICIENT
McCORD
MECHANICAL LUBRICATORS FOR SLUSH PUMPS & DRILLING ENGINES TYPE "SP"
TYPE C

McCORD LUBRICATORS

ACCURATE • DEPENDABLE • EFFICIENT

**WEIGHT INDICATOR POINTS**



Every driller knows that excessive bit pressure and excessive circulation pressure tend to make crooked holes. But in order to avoid these excesses, the driller must know when they occur.

The Martin-Decker "Sealtite" Drilling Control makes them instantly and constantly visible—puts every characteristic of the drilling string into clear sight—bit pressure—rotary speeds—torque—mud pressure—always in clear view irrespective of the depth of the hole or the kind of formation.

Use this modern, comprehensive system for guiding drilling with least expense and most direct results.

**MARTIN-DECKER CORP.**
LONG BEACH, CALIFORNIA
A. F. McQUISTON, BAKERSFIELD, CALIFORNIA
REED ROLLER BIT CO., HOUSTON, TEXAS

**PIPE LINE REPAIR CLAMPS**
Efficient—Economical More than 45,000 sold

Fig. 7002 Fig. 7001
MADE WITH 1 OR 2 U-BOLTS
In Stock for Immediate Shipment
**BROWN & BROWN, Incorporated**
LIMA, OHIO, U. S. A.

**GEOMORPHOLOGY**

*An Introduction to the Study of Landscapes*
BY A. K. LOBECK
Professor of Geology, Columbia University
731 pages, 6 x 9, fully illustrated. $4.50

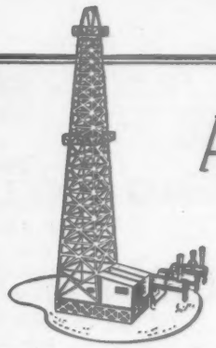
Here is an intensely interesting and graphic study of the face of the earth, systematically explaining all types of landscapes in terms of their origin and stage of development.

With many photographs and diagrams comprising about half of the volume, this book deals with the forms produced by destructive forces such as streams, glaciers, waves, wind and organisms, and describes several kinds of mountains, volcanoes and craters.

CHAPTERS

1. Introduction
2. Rocks and Structures
3. Weathering
4. Underground Water
5. Streams in General
6. Young Streams
7. Mature Streams
8. Alpine Glaciation
9. Continental Glaciation
10. Waves
11. Wind
12. Organisms
13. Coastal Plains
14. Plains and Plateaus
15. Dome Mountains
16. Block Mountains
17. Folded Mountains
18. Complex Mountains
19. Volcanoes
20. Meteor Craters

Book Department
**THE OIL AND GAS JOURNAL**
Tulsa, Oklahoma

# Among the Drilling

GORDON Oil Co., Mount Pleasant, Mich., has organized a complete drilling contracting division under I. F. Scott as rotary superintendent. The company has two contract rigs in operation in Michigan and a third being moved in from out of the state.

TOM RILEY, Mount Pleasant, Mich., has contract to drill a well in Osceola Township, in 33-3n-5e, Livingston County, Michigan, for H. C. Nelson of Muskegon.

T. L. BENSON, Shreveport, La., has contracted to drill 1 Seagers-4-P, in 3-23n-8w, Haynesville field, Claiborne Parish, North Louisiana, for Ohio Oil Co.

COOK Drilling Co., Shreveport, La., has completed a well drilled for Ohio Oil Co. on the Waller lease in the Haynesville field, Claiborne Parish, North Louisiana. The well flowed 858 bbl. in 24 hours from sand at 5,256-82 ft.

CROW Drilling Co., Shreveport, La., has been given the contract by F. R. Sylvestre to drill 1 McElwee, a wildcat test in 11-22n-7w, Claiborne Parish, North Louisiana.

PORTABLE Drilling Co., Tulsa, has contract for a wildcat test being drilled for Ross U. Porter, Shawnee, Okla., in 22-22n-2e, 2 miles southeast of the new Liberty pool and about the same distance west of the old Marathon pool, Noble County, Oklahoma. Location is on the Harsh lease.

IRON Drilling Co. is starting a joint test with Keener Oil & Gas Co. in 6-22-1w, south of the Graber pool, Harvey County, Kansas. The objective is the Arbuckle lime expected around 3,500 ft.

DELTA Drilling Co., Tyler, Tex., has the contract to drill Lone Star Gasoline Co. 1 W. J. Gentry, projected deep wildcat test in the C. M. Walters Survey, 3 miles southwest of Athens, southwestern Henderson County, Texas. The test is expected to go to the Travis Peak around 8,500 ft.

PAINE Drilling Co., Dallas, Tex., has the contract to drill Standard Oil Co. of Texas 1 Donnell, new southeast Young County, Texas, wildcat.

GEORGE LIVERMORE Drilling Co., Lubbock, Tex., will drill Sharpel 1 University, in the Barnhardt pool, Reagan County, Texas.

CRON & GRACEY, Houston, Tex., have completed another producer in the Lake Long field, La Fourche Parish, Louisiana, for Fohs Oil Co. In the meantime, two rotaries are running for Shell Oil Co., Inc., in the Gibson field, Terrebonne Parish, and the West Lake field, St. Martin Parish, Louisiana.

HARRY L. EDWARDS Drilling Co., Houston, Tex., received contract from PanAmerican Production Co. for another test in the Mayo field, Jackson County. In the Hester area, St. James Parish, Cities Service 1 Karstein is drilling below 11,000 ft., with gas-distillate sands reported to have been logged up the hole.

GREY & WOLFE, Houston, Tex., have cemented 7-in. casing at 10,355 ft. in La Gloria Corp. 1 Grogan-Cochran Co., a wildcat located 3 miles southeast of Magnolia, Montgomery County, Texas. An electrical log is reported to have shown possible production, but the hole is expected to be drilled deeper before a production test is made.

TWO STATE Drilling Co., Houston, Tex., logged encouraging showings in Ohio Oil Co. 1 First National Bank, a wildcat located in the Orange Hill area, Austin County, Texas. Drill-stem testing at 9,084-9,137 ft., and 9,143-64 ft., tested several hundred pounds of working pressure and some gas-distillate-cut mud. The well was shut down at 9,274 ft. to run electrical log.

FAIN Drilling Co., Houston, Tex., was coring in the Wilcox below 8,288 ft. in the company's 1 Hattie Baldwin, a wildcat 3½ miles west of the Mercy field, San Jacinto County. No showings of oil or gas have been reported.

HENSHAW BROTHERS, San Antonio, Tex., are moving a rotary rig to western San Patricio County for 1 N. Panherz, a wildcat located in the Cubbage and Miller Survey. The well will be drilled jointly with Coastal Refineries, Inc., and is contracted to a depth of 5,500 ft.

PETROLEUM WELLS Service Co., Houston, Tex., is preparing to start drilling operations on two more new wells in the Stewart field, Jackson County, for W. Stewart Boyle. The wells are 2 and 4 Rose and Sample. In the meantime, 2 Meyer, located about 2,000 ft. southeast of production, is reported showing for a producer while cleaning out.

PARKER Drilling Co., Tulsa, has reached a depth of 5,204 ft. in its 1 Druley, wildcat test in 28-23-34w, Kearny County, Kansas, and has shut down operations temporarily.

SMITH BROTHERS Drilling Co., Shawnee, Okla., has moved in rig for 1-A Billington, in 22-9n-4e, Hotulke area, Pottawatomie County, Oklahoma. The well is being drilled for its own account.

ZEPHYR Drilling Co., Tulsa, has made location for 2-A Sinclair, in 34-17-8, Creek County, Oklahoma.

ROBERT W. ATHA has been awarded contract by Gulf Refining Co., eastern production division, to drill 1 Francis, 1-14n-4e, Bay County, Michigan.

ASHBY Drilling Co., Grand Haven, Mich., has made location to drill 1 Flora C. Landon, in 34-1s-3w, Jackson County, Michigan.

R. A. WELLS, drilling contractor, Grand Rapids, Mich., has contract to drill a well for Swanson Consolidated Oil Co. on the Kragnes lease in 15-19n-14w, Lake County, Michigan.

RILEY Drilling Co., Muskegon, Mich., has contract to drill H. C. Nelson 1 Lewis Walker, 33-3n-5e, Livingston County, Michigan.

BELMONT QUADRANGLE Drilling Corp. has moved in rig to drill an Oriskany sand test for its own account on the Jesse Lewis lease, West Union Township, Steuben County, New York. Expected depth is below 5,200 ft.

HOLLOW Drilling Co., Wichita, Kans., has made location for a joint test to be drilled for Frank Hollow and N. Appleman & Co. on the Drumler lease, in 5-14s-13w, 3 miles north of the Hall-Gurney pool, Russell County, Kansas.

HOLLINGSWORTH Drilling Co., Shreveport, La., has run into a bit of trouble in drilling its 1 Benefield & Singleton, James Wanhop Survey, south offset to the discovery well of the new Kildare field, southern Cass County, Texas. Within 130 ft. of the top of the producing horizon, drill

# Contractors

pipe stuck at 5,870 ft. After an unsuccessful fishing attempt, the hole has been junked.

CLIFFORD A. PERRY, Grand Rapids, Mich., is the contractor on a well being drilled for himself and Gould and Cross on the Baron and Nykamp lease, in 31-5n-14w, Ottawa County, Michigan.

J. C. ARTHUR, Inc., Clare, Mich., has contract to drill for Freeman Oil Co. on the State-Roscommon C lease, in 21-21n-3w, Roscommon County, Michigan.

RICHMOND Drilling Co., Odessa, Tex., which recently acquired Ochiltree & Robinson 1 Johnson, southeastern edge of the South Cowden field, which was shut down since May 1940, after failing to show at 4,273-40 ft., has cleaned out and deepened the hole to 4,480 ft., where it now is showing for a producer.

W. W. ZIMMERMAN, drilling contractor, McAllen, Tex., is skidding rotary rig to Fidelity 1-B Sugarland, third test for the new Ulrich field, Starr County, South Texas. The new location is 1,500 ft. west of the discovery well, which found production at 3,945-60 ft.

H. H. STAGGS, drilling contractor, Rio Grande City, Tex., was forced to shut down his rig which was operating for Ordovician Petroleum Co. on the latter's 1 Starr County Cattle Co. wildcat in south central Starr County. The rig was damaged in a recent windstorm which also wrecked the derrick. Approximately 3,600 ft. on a 6,000-ft. contract had been completed.

INGLING & PARKER, Wichita, Kans., are the contractors on a wildcat test being drilled by J. W. Dutton in 9-1n-2e, north of Davis, Murray County, Oklahoma.

PENROD Drilling Co., Shreveport, La., has contracted to drill a 7,000-ft. test for H. L. Hunt on the Southern Bag & Paper Co. holdings, Bienville Parish, Louisiana. Location of the test is in 11-17n-6w.

HERNDON Drilling Co., Tulsa, has started a semiwildcat test on the Jones land in 27-26s-1w, 10 miles southwest of the new English gas pool, Edwards County, Kansas. Seth W. Herndon, president of the drilling company, is one of the principal owners of the project.

KERR-McGEE & Co., Oklahoma City, Okla., contractors for the Texas Co. on the latter's 1 Patchell-Community, northwest trend of the Pauls Valley field, Garvin County, Oklahoma, have been authorized to proceed with drilling following a delay occasioned by a shift in location. The same contractors have a rig running for Pure Oil Co. on the east flank of the Edmond field, Oklahoma County.

GLASSELL & GLASSELL, Shreveport, La., received contract from Continental Oil Co. for a wildcat in 35-10n-8e, Catahoula Parish, Louisiana. Contract is for 5,850 ft. The test will be on Continental's Jones lease.

●

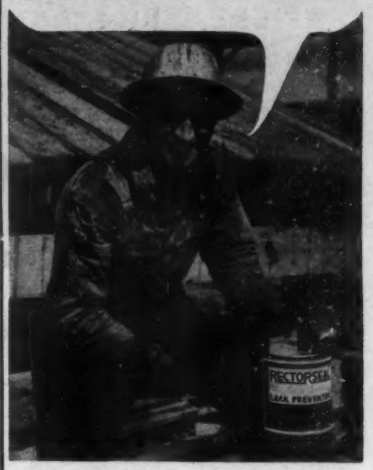
## Drilling Crews Are Eligible for Recaps

DALLAS, Tex.—The American Association of Oil Well Drilling Contractors, in response to an inquiry by Brad Mills, executive secretary, has been advised by Max McCullough, regional administrator of tire rationing that drilling crews of contractors probably are eligible for recapped tires, although not eligible for new casings.

Mr. McCullough stated that drilling crews are "workers whose occupations or duties are of a nature which cannot reasonably be performed at a fixed place or in regular hours, since they frequently change their drilling locations and it is our opinion that their drilling operations constitute extractive establishments within the purview of such section (Section 504-a-3, rubber rationing order)."

*Crew of the Shinholt Drilling Contracting Co., Centralia, Ill., on location near Salem. K. A. Buckingham, tool pusher; Lyle Thompson, driller, and Gardner Winks, tool dresser*


INSURANCE BY THE GALLON




By applying RECTORSEAL to every mud, oil, water, gas or steam line around your location when you lay it, you're assuring yourself of leak-free days from then on.

RECTORSEAL is unlike any of the many compounds used to protect threads from rust while on the rack and is not intended to compete with them. RECTORSEAL'S job is to prevent leaks and act as a lubricant when making up threads. It comes in liquid form, and when applied with a brush or swab, forms a plastic, elastic mass which seals and holds the seal indefinitely.

Instead of waiting for leaks to show themselves, use RECTORSEAL on all connections and forget leak troubles.

You can get this positive leak preventer from your nearest supply store in gallon cans, or in any size to suit your needs. But . . . be sure to ask for it by name.

RECTORSEAL
THE POSITIVE LEAK PREVENTER

COUNT ON
DEVIL DOG No. 3
for WAR and
for VICTORY

No. 3 Devil Dog A. P. I. 3

Jeffrey contributes 65 years of chain-building experience to make oil well chain a dependable adjunct to the national war effort.

THE JEFFREY MFG. CO
891-99 N. FOURTH ST., COLUMBUS, O.
Texas Sales Office: 6358 Auden St., Houston

# Personal Paragraphs

VERNE AUSTIN, formerly petroleum engineer with the California State Division of Oil and Gas, and now a major in the U. S. Army Air Corps, has been appointed head of a plant protection unit for oil industry facilities in California.

LT. COMDR. W. H. OSGOOD, who has served as director in charge of OPC District 5 with headquarters in Los Angeles, Calif., was recently advanced to a full commander by the Navy Department.

ALLEN H. FLAHERTY, independent oil operator, Midland, Tex., has joined the Army Air Force Ferry Command.

W. DOW HAMM has been made chief geologist, Atlantic Refining Co., Dallas, Tex. He formerly was associated with Shell Oil Co., Inc.

R. W. McDOWELL, vice president of Mid-Continent Petroleum Corp., has been reelected president of the Tulsa Downtown Quarterbacks Club.

A. W. HUBBELL, manager of the gasoline pipe-line division, Phillips Petroleum Co., Bartlesville, Okla., has retired after 20 years of active service with this company.

ENS. R. H. ROBIE, formerly district geologist for Shell Oil Co., Inc., San Antonio, Tex., has been assigned to the maintenance division, Bureau of Aeronautics, Washington, D. C.

DR. D. S. MUZZEY, JR., research engineer in the geophysical laboratory, Shell Oil Co., Inc., Houston, Tex., has joined the staff of the Naval Ordnance Laboratory, Washington, D. C.

R. S. CHRISTIE, formerly engineer with Amerada Petroleum Corp., Fort Worth, Tex., has been commissioned a first lieutenant in the Coast Artillery and is stationed at Fort Rosecrans, San Diego, Calif.

J. A. NEATH, director of Humble Oil & Refining Co., Houston, Tex., has been appointed chairman of the big-gifts division of the Houston War-Community Chest. Mr. Neath will be assisted by W. M. WHELESS, assistant head of the land, lease and scouting department, Gulf Oil Corp., who has been named assistant chairman.

JOSEPH G. HATHAWAY, engineer with the Schlumberger Well Surveying Co., in Venezuela, has returned to the United States to enter the Army. He reported for duty at Denver, Colo., but since has left for California.

ROBERT J. HULL, division sales manager, Cities Service Oil Co., New York, has been appointed representative of the Office of Petroleum Coordinator for War in the New England states. Mr. Hull is a graduate of Massachusetts Institute of Technology and has been associated with the oil business since 1923.

JOHN T. HAYWARD has been given a leave of absence from his duties as vice president in charge of research of the Barnsdall Research Corp. to accept a war position with the Naval Ordnance Laboratory. He left Tulsa Tuesday for Washington, D. C. Mr. Hayward saw service as captain in the Royal Engineers in the World War I and for 19 years was connected with oil operations in Rumania. He came to this country in 1929 and became chief production engineer of the Barnsdall Oil Co. in 1931. He has been associated with important technical developments in production practices in recent years. He addressed Tulsa Nomads at their monthly luncheon Monday.

LOU J. NELSON, drilling foreman for Shell Oil Co., Inc., St. Gabriel, La., has retired and now is residing in Oregon.

GEORGE R. JOHNSON, landman for Sinclair Prairie Oil Co. in Kansas, has been transferred to Tyler, Tex., where he will be head of the land department in that district.

VICTOR McGOWEN, production clerk, Sunray Oil Co., Oklahoma City, Okla., has been transferred to Allen, Okla., to replace RICHARD L. SANDERS, who has entered the Army.

DR. CLAUDE ALBRITTON, JR., vice president, Dallas Petroleum Geologists, Dallas, Tex., has received an appointment for special war service, and has left for his assignment.

LEO W. WARD, engineer, Hewitt station, Oklahoma Pipe Line Co., Wilson, Okla., has retired from active service because of ill health. He has been with the company 25 years.

FRED TURNER, JR., independent oil operator, and A. KNICKERBOCKER, his office manager, Midland, Tex., have enrolled for pilot training in a civilian flying school, Hobbs, N. M.

WILLIAM PANNILL, division chief counsel of the legal department, Ohio Oil Co., Houston, Tex., is engaging in private practice of law at Fort Worth, Tex., following his recent retirement from active service with the company.

GEORGE L. THOMPSON, former oil producer, Shawnee and Ada, Okla., has received a commission as first lieutenant and has been assigned to the 406th Base Headquarters and Air Base Squadron, Army Air Corps, Camp Petree, Rosecrans, St. Joseph, Mo.

## Do You Remember?

From The Oil and Gas Journal Files

### 40 YEARS AGO

It is reported that an English syndicate, represented by James Roche, now in Beaumont, has secured an option on the property of Sour Lake Springs Co., at a purchase price of $1,000,000.

D. O. Lively, secretary and manager of Buffalo Oil Co., has tendered his resignation to the directors of the company, in order that he might have more time to devote to his personal interests at Spindletop.

A special train brought 1,500 excursionists to Beaumont from Houston last week to see the damage wrought by the Spindletop fire. There was little to see except charred timbers and blackened machinery.

### 25 YEARS AGO

Work on the oil refinery at Maracaibo is proceeding rapidly, about 1,000 Negro workers being employed on it. Oil from Maracaibo is to be refined at this plant.

In the exemption of oil-well workers from military duty, there seems to be a disposition in California to permit drillers to continue their work on the wells, while tool dressers are conscripted.

There is a suspicion in the minds of many that President Wilson is gradually reaching the conclusion that oil regulation, after the fashion of coal control, is becoming necessary. Oil men find no comfort in this.

### 10 YEARS AGO

E. M. Lyons, of Tiona Refining Co., was reelected president of the National Petroleum Association for his sixth consecutive term. Charles L. Suhr was named vice president, succeeding the late Phillip S. Tarbox.

Shell Petroleum Corp. now has under construction a coke tipple at its Houston refinery and is also building an extension to its docks for loading oil.

The Texas Railroad Commission has cut back the per-well allowable in East Texas to 46 bbl. per day from the 50-bbl.-per-well limit which has held since September 1.

HOWARD E. ITTEN, assistant computor, Stanolind Oil & Gas Co., Tulsa, has been transferred to Mount Pleasant, Tex.

HAROLD W. HAIGHT, manager, Standard Oil Co. of Egypt, has returned to Africa after spending several months in the United States.

CHARLES B. SWAIN, junior petroleum engineer, Pyote, Tex., district, Humble Oil & Refining Co., has been transferred to Hobbs, N. M., where he has been made district engineer.

J. P. McCULLOCH, assistant to the manager of foreign production for the Texas Co., has returned to his headquarters at New York following a survey of company operations in South America.

E. L. BUELOW, division superintendent, Community Natural Gas Co., San Angelo, Tex., has been appointed a member of the local area's industrial salvage committee of the War Production Board.

PAUL BENEDUM, president, Benetex Oil Co., and manager of Benedum-Trees Oil Co., Houston, Tex., has been appointed chairman of the central division, Community War Chest of Houston and Harris counties.

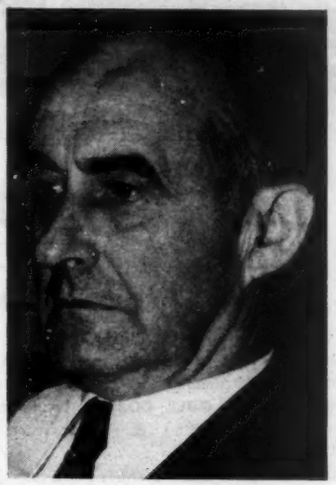
DONALD M. ANDERSON, Shell Oil Co., Inc., who has been division foreman in the production department for Los Angeles Basin, has been appointed engineer and transferred to the company's Wilmington, Calif., refinery.

C. V. BAXTER, program chairman of the Taft chapter of the California Natural Gasoline Association for September, will have as his guest at the next meeting JACK JUDY, of Superior Oil Co., who will discuss the latest developments in isobutane extraction.

A. DANCIGER, vice president of Danciger Refineries, Inc., with offices in Tulsa, left Saturday for several weeks in the East. Before starting he said he wanted to make the stay a vacation but that he had enough work lined up in advance to make it look like a business trip.

# New N.P.A. President

Harry Allison Logan, Warren, Pa., who has been instrumental in guiding United Refining Co. through 40 years of successful operation, will now launch the National Petroleum Association, the oldest oil-trade organization in the country, on its fifth decade of service to the industry. He was elected president of the N.P.A. last week at its annual meeting in Pittsburgh, Pa.



*HARRY ALLISON LOGAN*

Mr. Logan was one of a group of men who organized the United Refining Co. at Warren in 1902. He started as an accountant with the United company and through the years has risen to the four positions he now holds simultaneously. He is vice president, general manager, treasurer and a director. He also is president of Elk Refining Co., Charleston, W. Va.; president of Emblem Oil Co., Warren and of Red Star Lubrication Service, Jamestown, N. Y.; vice president of J. L. Yeardon & Co., Bradford, Pa.; vice president and director of Warren Bank & Trust Co., and a director of the American Petroleum Institute.

His decision to seek his career in the oil industry 40 years ago was not by happen-stance. His father, Ryland M. Logan, was one of the pioneer producers in the Pennsylvania fields.

Mr. Logan was born in Summit City, Pa., in 1881, when oil development of that area was at its peak. Four years later his family moved to Warren where he received his early education. Completing a course in Erie Business College in 1899, he started work in the veneer plant where he remained until 1902.

During World War 1, Mr. Logan was a member of subcommittees of the National Petroleum War Service Committee. Now he is a member of the OPC District 1 transportation committee and chairman of the District 1 tank-car subcommittee.

His hobbies are farming, golf and horseback riding. He maintains a country home as well as his residence in Warren. He and Miss Helen Temple, of London, England, were married in 1922, and they have two children.

LONNIE GRIFFIN, driller for Lupher Drilling Co., Mount Pleasant, Mich., has been made rotary tool pusher, succeeding WALTER CHAPPEL, recently resigned.

J. GARFIELD BUELL, independent oil operator, Tulsa, has been chosen chairman of the Tulsa chapter of Russian War Relief, Mr. Buell has traveled extensively in Russia.

T. J. DONOVAN, petroleum engineer, Texas Petroleum Co., Caracas, Venezuela, S. A., has returned to this country, where he lately has been located at Mingo Junction, Ohio.

CECIL A. HAMMAN, field engineer, Ohio Oil Co., Yates pool, Iraan, Tex., is now serving as first lieutenant in the ordnance department at the Army proving grounds, Aberdeen, Md.

JAMES STOCKMAN, formerly engineer for Shell Oil Co., Inc., New York, has been commissioned first lieutenant in the Army and assigned to duty as regimental transportation officer at Fort Bliss, Tex.

LOU MOSS, chief engineer, Station 3, Illinois Pipe Line Co., Sunburst, Mont., has been transferred to North Camp, Mont., as connection foreman. He has been succeeded at Station 3 by JOHN FINDLAY.

CARL M. WHITE, former assistant to the traffic manager, Stanolind Oil & Gas Co., Tulsa, has entered the Air Force officers' training school at Miami Beach, Fla., where he holds a commission as second lieutenant.

FRED A. SCHULTZ has been made manager of Major Oil Investments (Taber), Ltd., recently organized subsidiary of Major Oil Investments, Ltd., Calgary, Canada. The new subsidiary was formed to develop 3,240 acres in the Taber field.

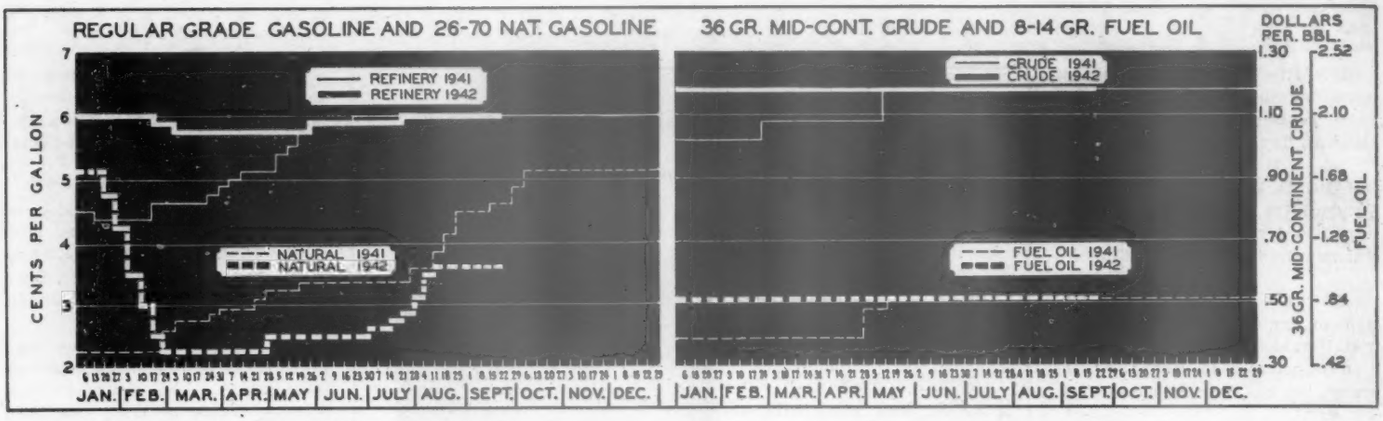
HILAND G. BATCHELLER, president of the Allegheny-Ludlum Steel Corp., Pittsburgh, Pa., has been made head of the Iron and Steel Branch, War Production Board. He succeeds REESE H. TAYLOR, president of the Union Oil Co. of California, recently resigned.

Shifts: L. P. BLANTON, superintendent, Omega Oil Co., Longview to Bombardier School, Big Spring, Tex.; C. J. KNUTSON, engineer, Plantation Pipe Line Co., Marshall, Tex., to Louisville, Ky.; PARK J. JONES, engineer, Texas Co., Fort Worth to Houston, Tex.; HARRY WASZKOWSKI, junior engineer, Magnolia Petroleum Co., Vanderbilt, Tex., to New Orleans, La.; H. L. DAVIS, superintendent, Williams Brothers Corp., Homestead, Fla., to Flora, Ill.; T. C. TERRELL, engineer, Stanolind Pipe Line Co., Manhattan, Ill., to Tomball, Tex.; GEORGE W. KONZ, engineer, Carter Oil Co., Winnsboro, La., to Hazlehurst, Miss.; H. E. LILLIBRIDGE, geologist, Eason Oil Co., Shreveport, La., to Enid, Okla.; HAROLD R. SELLS, engineer, Kerlyn Oil Co., Oklahoma City, Okla., to Effingham, Kans.; A. O. CROWNOVER, engineer, Phillips Petroleum Co., Phillips, Tex., to Tulsa; W. G. IVERSON, engineer, Continental Oil Co., George West to Crockett, Tex.; PRICE STEPHENSON, engineer, Magnolia Pipe Line Co., Martinesville, Ill., to Brazil, Ind.; P. D. BLACKBURN, superintendent, Magnolia Petroleum Co., Drumright, Okla., to Dallas, Tex.

JOHN MABEE, drilling contractor, has been chosen general chairman of the Tulsa War Chest campaign to be held October 19-30. Oil men serving as vice chairmen include WAITE PHILLIPS, independent operator and capitalist; W. G. SKELLY, president Skelly Oil Co.; E. H. MOORE, president, E. H. Moore, Inc., and H. G. BARNARD.

LEON E. SCHROEDER, division superintendent, motor transport division, Mid-Continent Petroleum Corp., Tulsa, will leave October 1 to accept an assignment with the Navy.

HARVEY B. WILLIAMS, Pan American Refining Co., Texas City, Tex., has been elected national association representative of the Gulf Coast chapter of the American Society of Safety Engineers. Other oil industry officers elected by the chapter are KRAUS EARHART, Texas Co., general chairman; PAUL V. WILSON, Humble Oil & Refining Co., vice chairman; C. H. DARDEAU, Hughes Tool Co., treasurer; C. B. BOONE, Gulf Oil Corp., and R. G. NAUL, Hughes Tool Co., executive committeemen.




# MARKET DEVELOPMENTS . . .

## East Coast

NEW YORK.—The announcement from Washington that card rationing of fuel oil would be placed in effect in 30 states including the Atlantic Coast territory on October 15 was the week's high spot in developments in the eastern markets. The move had been expected for weeks, although some oil men thought the inherent difficulties involved in equitable apportionment of supplies would deter government officials from launching the step.

The intensive campaign to induce oil-burner operators to shift to coal fuel has resulted in about 40,000 conversions to date, according to figures released last week by Laurence B. Davis, OPC District 1 director of marketing. He added that "possible" conversions in the East Coast territory numbered as high as 250,000. This would indicate the campaign to date has been about 15 per cent effective. The belief is current that there may be a last minute rush to convert, but few anticipated that a majority of the 250,000 "possible" conversions will materialize. This means that the petroleum industry will have to use all available transportation facilities this winter to supply the fuel-oil demand in this district together with other essential needs for petroleum products, including gasoline.

This, in turn, raises the question of whether East Coast motorists will continue to get their minimum ration of 4 gal. of gasoline weekly through the winter. Authoritative sources indicate that the present program of 4-gal. minimum weekly allowance will be continued until November 22, when a change will be considered, depending on the existing situation at that time.

Refined-petroleum prices are holding firm at ceiling levels, trade reports indicate.

## Mid-Continent

MAJOR interest in the Mid-Continent refinery market swung this week to burning oils, including distillates, kerosene and residuals. If the call for any particular grade exceeded that accorded the others it probably was for residuals.

However, imminence of coupon rationing and the amendment of Restrictive Order L-56, authorizing distributors and consumers to fill all domestic tanks to the extent of 275 gal. spurred interest in Nos. 2 and 3 burning oils.

Refiners and tank-wagon distributors maintained their quotations at ceiling levels and it was admitted in the trade that prices would move upward several points except for the restrictions imposed by the Office of Price Administration.

Record volumes of all grades of fuel oil were loaded and moved this week from Mid-Continent refineries, continuing a trend in the distribution mechanism instituted at the start of September.

Demand for gasoline, particularly in the northern part of the Middle West, was reported to be receding in keeping with the normal reaction of Labor Day. Considerable motor fuel is still moving into agricultural districts where movement of bumper crops to market is now at peak levels. Also, defense areas and military posts are calling for maximum contract commitments.

The speedup of manpower induction into the armed forces, precipitating increased motor-fuel consumption for transportation and training, is admittedly an important factor in maintaining the gallonage for regular gasoline.

Buyers, however, are showing less interest in motor-fuel supplies. The lag of inquiries, in some instances, is disproportionate to the season and is accepted as further indication that voluntary curtailment of automobile operation is practically offsetting the coupon system that will be made effective at some indefinite future date.

Interior refiners are making additional adjustments in their manufacturing operations to increase the yield of fuel and lower the output of motor gasoline in keeping with market conditions and in response to the recommendations of industry committees and the Office of Petroleum Coordinator.

### SENTENCE SUMMARIES

**MID-CONTINENT:** Middle West buyers and inland refiners turn chief attention to fuel-oil conditions. Prices unchanged.

**GULF COAST:** Lend-lease requirements increasing. Eastern movement by rail setting new records.

**EAST COAST:** Abolishment of company brands, pooling of supplies and facilities may ease supply problem.

**PACIFIC COAST:** Motor-fuel prices soften. Demand for residual fuel maintained at record levels, stocks drift lower.

**PENNSYLVANIA:** Products steady. Supply in balance with demand and transportation limitations. Neutral oils more active.

## A.P.I. REFINERY REPORT

**Week Ended September 12, 1942**

(Figures in thousands of barrels)

| | Dly. crude runs to stills | Stocks: Gasoline | Residual | Gas oil |
|---|---|---|---|---|
| Appalachian | 165 | 2,876 | 471 | 634 |
| Ind., Ill., Ky. | 765 | 14,435 | 3,362 | 6,107 |
| Okla., Kans., Mo. | 373 | 6,931 | 1,383 | 1,844 |
| Censored area* | 1,579 | 39,415 | 18,811 | 22,235 |
| Rockies | 104 | 1,857 | 567 | 454 |
| California | 724 | 16,244 | 54,039 | 12,293 |
| Total Sept. 12, 1942 | 3,710 | 81,758 | 78,633 | 43,567 |
| Total Sept. 5, 1942 | 3,656 | 80,358 | 78,267 | 42,819 |
| Total Sept. 13, 1941 | 4,063 | 79,485 | 94,560 | 48,953 |

Note: Refinery runs and stocks for week ended September 19, 1942, appear on Trends page.

*Reports combined on East Coast, Texas Gulf, Louisiana-Arkansas and Inland Texas at request of OPC.

### CRUDE-OIL STOCKS

(Bureau of Mines estimate)

| Week ended: | Bbl. of crude* |
|---|---|
| September 12, 1942 | 244,871,000 |
| September 5, 1942 | 246,942,000 |
| September 13, 1941 | 245,164,000 |

*Excludes heavy, unrefinable stocks in California.

## Gulf Coast

HOUSTON, Tex.—There has been no reaction in the Gulf Coast refinery markets this week which was expected in some quarters to follow the announcement that nation-wide rationing would be started in the near future.

Natural gasoline which is expected to be the first to reflect any weakness in the market held steady at previous quotations and movement kept pace with recent volume.

Some observers had anticipated a weakness of the price structure by concessions from suppliers heavily stocked with material. While the effect of rationing is still being studied by Gulf Coast refineries, it is the general opinion that any reaction will be mild. Observers point out that shipments from the Gulf Coast area during the past several months have kept pace with the maximum of transportation facilities, and the major share of these products have been moved into rationed areas on the East Coast.

On the other hand, lend-lease business has gained momentum in recent weeks and any slackening up in domestic volume will be offset to some extent by lend-lease activity.

## Pacific Coast

LOS ANGELES, Calif. — The refined-products market is quiet and irregular. Gasoline prices are down fractionally. Natural gasolines are off slightly in sympathetic trends.

Fuel oil demand continues at a high rate, but little is moving in the spot market as marketers are taking all available.

Diesel-fuel prices are firm. Demand exceeds current supply. Some marketers are storing low grades to take care of possible demand for smudge oil next winter.

The lubricating-oil market has an improved tone, but prices are unchanged. Los Angeles city has ruled that eastern lubricating oil means those produced east of California.

# REFINERY AND TANK-WAGON PRICES

(Prices as of September 15)

## Refinery Gasoline

| Octane (A.S.T.M.): | †80 | 78 | 74-76 | 72-74 | 68-70 | 63-66 | 60 & lower |
|---|---|---|---|---|---|---|---|
| Mid-Continent* | | | | 5.875-6.000 | | 5.500-5.625 | 5.125-5.250 |
| Pennsylvania | | | 6.750-7.000 | | | | |
| Gulf Coast‡ | 6.00-6.50 | | | §5.750-6.250 | §5.750-6.250 | §5.250-5.750 | §5.000-5.500 |
| Northeast Coast | 9.80 | | | 9.2 | 9.2 | | |
| Pacific Coast | | 6.500-7.000 | 6.250-6.500 | 6.125-6.250 | 5.750-6.000 | 5.125-5.250 | 4.750-5.000 |

*Basis Group 3. †1939 C.F.R. (research method). ‡Integrated companies restricted to lowest prices. §Unleaded.

Quotations are f.o.b. plant in cars and in cents per gallon except where otherwise noted. They are exclusive of the federal excise taxes of 1.5 cents a gallon on gasoline and 4.5 cents a gallon on lubricating oils, and do not include marine lighterage charges.

## Natural Gasoline

| Grades: | 26-70 | 18-55 | 75-85(350-375) |
|---|---|---|---|
| Oklahoma (Group 3) | 3.625 | 4.350 | |
| North Texas | 3.250 | 3.900 | |
| North Louisiana | 3.375 | 4.050 | |
| California | | | 4.875-5.500 |

## Kerosene and No. 1 Fuel Oil

| Gravity: | 46 | 45 | 42-44 | 41-43 | 38-40 |
|---|---|---|---|---|---|
| Mid-Continent* | | | 4.500 | 4.375 | |
| North Louisiana | | | | 4.500-4.750 | |
| Pennsylvania | 6.250-6.625 | 6.125-6.250 | | | |
| California | | | | 4.500-5.500 | 4.250 |
| Northeast Coast | | | | 6.80 | |
| Gulf Coast | | | | 3.875 | |

*Basis Oklahoma Group 3.

## Tractor, Diesel, and Bunker Fuel Oil

| Specifications: | 46-48° G. | 24 D.I. | 48-52 D.I. | 58 & above | Diesel bunkers | Bunker C |
|---|---|---|---|---|---|---|
| Mid-Continent* | 4.125 | | | | | |
| California | | 2.750-4.000 | | | ‡$1.35-1.45 | $0.85-0.90 |
| Gulf Coast | | | 4.000 | 4.125 | 1.45 | 0.85 |
| Northeast Coast | | | | 6.800 | 2.780 | 1.65 |
| North Louisiana | | | | | | †0.80-0.85 |

*Basis Oklahoma Group 3. †10-14° gravity. ‡Pacific Specification 200.

## Furnace Oil, Gas Oil, Fuel Oil

| | No. 2 | No. 3 | No. 5 | No. 6 |
|---|---|---|---|---|
| Mid-Continent* | 3.625-3.750 | 3.500-3.625 | $0.85 | $0.85 |
| Pennsylvania (West) | 5.875-6.125 | 5.875-6.000 | †5.250-5.500 | |
| Northeast Coast | 6.7 | 6.7 | 1.95 | 1.65 |
| Pacific Coast | 5.5 | 5.5 | ‡0.80-95 | §0.80 |
| Gulf Coast | 3.875-4.0 | | 1.65 | 0.85 |

*Basis Oklahoma Group 3. †36-40 gravity fuel oil. ‡Pacific Specification 300. §Pacific Specification 400.

## Lubricating Oils

### Bright and Steam Refined

| | | |
|---|---|---|
| **OKLAHOMA (Group 3)—** | | |
| 200-210 D, 10-25 | | 27.00 |
| 150-160 D, 0-10 | | 23.00 |
| 120-125 D, 0-10 | | 22.00 |
| Steam refined: | | |
| 600 dark green (untreated) | 9.00 | 9.50 |
| **PENNSYLVANIA—** | | |
| Bright Stocks (Pennsylvania Grade No. 8 color, 140-150 at 210, 545-550 flash): | | |
| 10 pour point | | 30.50 |
| 15 pour point | | 29.50 |
| 25 pour point | 25.00 | 28.00 |
| Steam refined: | | |
| 600 | 15.00 | 16.00 |
| 650 | 15.50 | 16.50 |
| 600 flash | 16.00 | 17.50 |
| 650 flash | 17.00 | 17.50 |

### Neutral Oil

(Vis. at 100° F. except Pennsylvania and color N.G.A.)

| | | |
|---|---|---|
| **OKLAHOMA (Group 3)—** | | |
| 0-10 pour point: | | |
| 200-3 | | 15.00 |
| 300-3 | | 18.00 |
| 500-3 | | 19.50 |
| 600-3 | | 20.00 |

Note: Viscous neutrals, 10-25 pour, quoted 0.5 cent under 0-10 oils.

### Neutral Oil

| | | |
|---|---|---|
| **CALIFORNIA** | | |
| Pale oils: | | |
| 200-2½-3 | 7.00 | 7.75 |
| 400-3-4 | 7.25 | 8.00 |
| 600-3-4 | 8.75 | 11.00 |
| Red oils: | | |
| 200-4-5 | 7.00 | 7.75 |
| 400-5-6 | 9.00 | 11.00 |
| 500-900, 5-6½ | 9.25 | 11.25 |
| **GULF COAST—** | | |
| Pale oils: | | |
| 200-3 | 8.50 | 8.75 |
| 300-3 | 9.00 | 9.25 |
| 500-3½ | 9.75 | 10.00 |
| 750-3½ | 10.00 | 10.25 |
| 2,000-4 | 10.50 | 10.75 |
| 3,000-4 | 12.25 | 12.50 |
| **PENNSYLVANIA—** | | |
| 150 vis. at 70° F., 3 color, 400-405 flash: | | |
| Zero pour point | | 37.50 |
| 10 pour point | | 36.50 |
| 15 pour point | | 35.50 |
| 25 pour point | | 30.00 |
| 200 vis. at 70° F., 3 color: | | |
| Zero pour point | | 39.50 |
| 10 pour point | | 38.50 |
| 15 pour point | | 37.50 |
| 25 pour point | | 32.00 |

### Wax

(Cents per pound)

| | |
|---|---|
| **OKLAHOMA (Group 3)—** | |
| 124-126 (A.m.p.) w.c. scale | 4.250 |
| **PENNSYLVANIA (inland refineries)—** | |
| 122-124 (A.m.p.) w.c. scale | 4.250 |
| 124-126 (A.m.p.) w.c. scale | 4.250 |
| **NEW YORK—** | |
| Wax in bags fully refined: | |
| 130-132 (A.m.p.) wax | 5.850 |
| 133-135 (A.m.p.) wax | 6.150 |
| Crude scale: | |
| 124-126 (A.m.p.) w.s. | 4.250 |
| 124-126 (A.m.p.) y.s. | 4.250 |

## EXPORT PRICES

### Gasoline—60-62° Gravity, Maximum 400 End Point

| Octane: | 72-74 | 68-70 | 65-66 | 60 |
|---|---|---|---|---|
| Gulf Coast | 6.500 | 6.250-6.500 | 5.875 | 5.625 |
| Pacific Coast | | 6.125-6.500 | 5.875-6.000 | 5.500-5.625 |

### Distillate and Fuel Oil

| | Kerosene | Diesel fuel | | | Bunker |
|---|---|---|---|---|---|
| | 41-43 | 24 G. | 48-52 D.I. | 58 D.I. Bunkers | C grade |
| Gulf Coast | 4.000-4.250 | | 4.125-4.375 | 4.375 $1.65-80 | $0.85-95 |
| Pacific Coast | 4.750-5.000 | 1.25-30 | | †1.35-45 | *0.80-90 |

*Pacific Specification 400. †Pacific Specification 200

### Lubricating Oils

| | Neutral oils | | Bright and cylinder stocks | | |
|---|---|---|---|---|---|
| | 200-3 | 150-3 | 200-3 | 150-3 | 600&630 S.R |
| Mid-Continent | 16.8 | | 28.8 | 24.8 | |
| Pennsylvania | 43-50 | 41-46 | 36-37 | 36-37 | 26.5-27 |

## GASOLINE AND KEROSENE TANK-WAGON PRICES IN 50 CITIES

(Gasoline prices based on regular grades, tax included, undivided dealer)

### ATLANTIC AND NEW ENGLAND

(Socony-Vacuum Oil Co., Inc., and Atlantic Refining Co.)

| | Dealer tank wagon | Combined tax | Kero. tank wag. |
|---|---|---|---|
| Baltimore, Md. | 15.45 | 5.50 | 10.20 |
| Boston, Mass. | 14.90 | 4.50 | 9.50 |
| Burlington, Vt. | 16.90 | 5.50 | .... |
| Buffalo, N. Y. | 16.20 | 5.50 | 10.30 |
| Dover, Del. | 16.70 | 5.50 | 11.20 |
| Hartford, Conn. | 15.60 | 4.50 | .... |
| Manchester, N. H. | 17.30 | 5.50 | 10.50 |
| Newark, N. J. | 14.70 | 4.50 | 9.40 |
| New York, N. Y. | 16.10 | 5.50 | 9.50 |
| Philadelphia, Pa. | 16.20 | 5.50 | 11.65 |
| Pittsburgh, Pa. | 16.70 | 5.50 | 12.00 |
| Portland, Me. | 16.30 | 5.50 | 9.60 |
| Providence, R. I. | 15.00 | 4.50 | 9.30 |
| Washington, D. C. | 14.70 | 3.50 | 10.70 |
| Average 14 cities | 15.91 | 5.07 | 10.32 |

(All prices undivided dealer basis.)

### CENTRAL

(Standard Oil Co. of Indiana, Standard Oil Co. of Ohio, Continental Oil Co. and Texas Co.)

| | Dealer tank wagon | Combined tax | Kero. tank wag. |
|---|---|---|---|
| Chicago, Ill. | 13.40 | 4.50 | 10.30 |
| Cleveland, Ohio | 15.00 | 5.50 | *9.00 |
| Dallas, Tex. | 13.00 | 5.50 | 7.00 |
| Des Moines, Iowa | 14.40 | 4.50 | 9.80 |
| Detroit, Mich. | 14.40 | 4.50 | 9.60 |
| Fargo, N. D. | 16.90 | 5.50 | 11.30 |
| Huron, S. D. | 16.30 | 5.50 | 10.70 |
| Indianapolis, Ind. | 15.20 | 5.50 | 9.80 |
| Little Rock, Ark. | 17.50 | 8.00 | 10.00 |
| Milwaukee, Wis. | 16.10 | 5.50 | 10.50 |
| Minneapolis, Minn. | 15.40 | 5.50 | 10.30 |
| Omaha, Neb. | 15.40 | 6.50 | 9.80 |
| Tulsa, Okla. | 16.50 | 7.00 | 8.50 |
| Wichita, Kans. | 12.70 | 4.50 | 8.00 |
| Average 14 cities | 15.15 | 5.57 | 9.61 |

*Includes 1-cent state tax.

### SOUTHEASTERN

(Standard Oil Companies of New Jersey, Kentucky, and Louisiana)

| | Dealer tank wagon | Combined tax | Kero. tank wag. |
|---|---|---|---|
| Atlanta, Ga. | 21.40 | 7.50 | 11.40 |
| Birmingham, Ala. | 18.50 | 8.50 | 9.00 |
| Charleston, S. C. | 18.45 | 7.50 | .... |
| Charleston, W. Va. | 18.75 | 7.50 | 13.00 |
| Charlotte, N. C. | 19.60 | 7.50 | 11.00 |
| Jacksonville, Fla. | 21.40 | 8.50 | 10.40 |
| Jackson, Miss. | 17.50 | 7.50 | 8.50 |
| Louisville, Ky. | 16.50 | 6.50 | 8.50 |
| Memphis, Tenn. | 18.60 | 8.50 | 10.50 |
| New Orleans, La. | 16.75 | 8.50 | *10.00 |
| Norfolk, Va. | 16.95 | 6.50 | 13.50 |
| Average 11 cities | 18.58 | 7.59 | 10.58 |

*Includes 1-cent state tax.

### MIDWESTERN

(Continental Oil Co.)

| | Dealer tank wagon | Combined tax | Kero. tank wag. |
|---|---|---|---|
| Albuquerque, N. M. | 17.50 | 7.50 | 10.00 |
| Boise, Idaho | 20.10 | 6.50 | 16.50 |
| Casper, Wyo. | 17.00 | 5.50 | 12.00 |
| Denver, Colo. | 14.50 | 5.50 | 11.00 |
| Helena, Mont. | 17.00 | 6.50 | 13.00 |
| Phoenix, Ariz. | 18.50 | 6.50 | 12.50 |
| Reno, Nev. | 17.50 | 5.50 | 13.50 |
| Salt Lake, Utah | 18.50 | 6.50 | 14.50 |
| Average 8 cities | 17.58 | 6.25 | 12.88 |

### PACIFIC COAST

(Standard Oil Co. of California)

| | Dealer tank wagon | Combined tax | Kero. tank wag. |
|---|---|---|---|
| Portland, Ore. | 17.00 | 6.50 | 13.50 |
| San Francisco, Calif. | 14.50 | 4.50 | 11.50 |
| Seattle, Wash. | 17.00 | 6.50 | 13.50 |
| Average 3 cities | 16.17 | 5.83 | 12.83 |
| Average 50 cities | 16.57 | 5.96 | 10.76 |
| Average last week | 16.57 | 5.96 | 10.76 |

## Rocky Mountain Area

(Continued from Page 237)

a location for another well on the Sherrard dome, Carbon County, Wyoming, in its 2 Mary Carter, NE SE SW 32-25n-88w, ½ mile east of 1 Carter, a gas discovery in the Dakota series at 4,433 ft., in April 1941, after plugging back from 5,185 ft. The discovery made 8,000,000 cu. ft. initial. Subsequently the company drilled a test on the north high which had approximately the same results as the first well.

### COLORADO COMPLETIONS

Rangely, Rio Blanco County: United Oil Production 4 Hunter-Green, NW NW SW 5-1n-102w. T.D. 900 ft., 495 ft. oil in hole from shale.

### WYOMING COMPLETIONS

Circle Ridge, Fremont County: Continental Oil Co. 7 Shoshone-766, CEL SE NE 1-6n-3w, T.D. 278 ft., 8⅝-in. 170 ft., bailed 15 bbl. an hour from the Embar.

Lance Creek, Niobrara County: Continental Oil Co. 6 Apex-4, SW NW NW 35-36n-65w, T.D. 4,086 ft., 7-in. 4,014 ft., swabbed 3 bbl. an hour through tubing from the Sundance.

### MONTANA COMPLETIONS

Cut Bank, Glacier County: Santa Rita Oil & Gas Co. 1 Kruger, C SW NE 23-37n-5w, T.D. 2,608 ft., 7-in. 2,577 ft., Sunburst sand 2,558-83 ft., 5,000,000 cu. ft. of gas at 2,558-77 ft., some oil at 2,577-83 ft., water in sand, probably Cut Bank, at 2,608 ft., P.B. to test showing at 2,577-83 ft.

Glacier Production Co. 11 Miller, C NE NW 29-33n-5w, T.D. 3,090 ft., 7-in. 3,054 ft., Sunburst sand 3,010-25 ft., Cut Bank 3,054-86 ft., main pay 3,072-86 ft., P.B. to 3,087 ft., swabbed 115 bbl. first 24 hours, then shot with 80 qt. at 3,067-87 ft., cleaning out.

## CRUDE-OIL PRICES

Representative selected crude prices from all sections of the country appear below:

| | |
|---|---|
| East Texas | $1.25 |
| Conroe | 1.43 |
| Tepetate, Louisiana | 1.18 |
| Illinois basin | 1.37 |
| Pecos County, Texas | .95 |
| Bradford, Pennsylvania | 3.00 |
| Van, Van Zandt County, Texas* | 1.08 |

*No change since 5-21-41.

### Gravity Schedules

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

| Gravity | Signal Hill, Calif. | Oklahoma, Kansas | Gulf Coast, Texas | West Texas* |
|---|---|---|---|---|
| 18-18.9 | $0.80 | .... | .... | .... |
| 19-19.9 | .84 | .... | $1.06 | $0.70 |
| 20-20.9 | .88 | $0.85 | 1.08 | .72 |
| 21-21.9 | .92 | .87 | 1.10 | .74 |
| 22-22.9 | .96 | .89 | 1.12 | .76 |
| 23-23.9 | 1.00 | .91 | 1.14 | .78 |
| 24-24.9 | 1.03 | .93 | 1.16 | .80 |
| 25-25.9 | 1.07 | .95 | 1.18 | .82 |
| 26-26.9 | 1.11 | .97 | 1.20 | .84 |
| 27-27.9 | 1.15 | .99 | 1.22 | .86 |
| 28-28.9 | 1.18 | 1.01 | 1.24 | .88 |
| 29-29.9 | 1.20 | 1.03 | 1.26 | .90 |
| 30-30.9 | 1.23 | 1.05 | 1.28 | .92 |
| 31-31.9 | .... | 1.07 | 1.30 | .94 |
| 32-32.9 | .... | 1.09 | 1.32 | .96 |
| 33-33.9 | .... | 1.11 | 1.34 | .98 |
| 34-34.9 | .... | 1.13 | 1.36 | 1.00 |
| 35-35.9 | .... | 1.15 | 1.38 | 1.02 |
| 36-36.9 | .... | 1.17 | 1.40 | 1.04 |
| 37-37.9 | .... | 1.19 | 1.42 | 1.06 |
| 38-38.9 | .... | 1.21 | 1.44 | 1.08 |
| 39-39.9 | .... | 1.23 | 1.46 | 1.10 |
| 40 and above | .... | 1.25 | 1.48 | 1.12 |

*Includes Lea County, New Mexico.

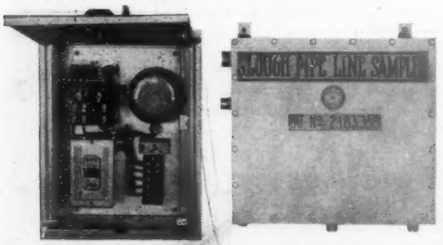
# EQUIPMENT PROGRESS...

## Pipe-Line Samplers

Two new improved-type pipe-line samplers are products of Nelson Electric Manufacturing Co. of Tulsa. One of the two types (shown at top) is the Nemco automatic pipe-line sampler, a well-built, simple mechanism that will operate under 1,000-lb. pressure. The sample pump is in the discharge side and pressure on the equipment can never exceed line pressure. This unit will take continuous sample and takes

samples under pressure, keeping sample under the same pressure. It gives true vapor pressure and gravity of sample with true b.s. sample, not contaminated with water.

The samples are automatically taken in small increments, which are taken at definite or variable time intervals. Variable time intervals are obtained by using a contact-making flow meter. In this application each increment is taken per unit flow of liquid in the pipe line. These small samples are stored under line pressure and truly represent a composite sample of the fluid that has passed through the pipe line during the sampling period which may be every hour shift or 24 hours. Use of an automatic sampler eliminates the "boiler house" samples that are sometimes taken and it is evident that this method is superior to the hand method of taking a sample every hour.




The second type offered is the Slough automatic pipe-line sampler which removes oil samples from the pipe line, once each hour, depositing the sample in can provided automatically and in accordance with A.P.I. requirements, permitting attendant to collect sample at convenience. It complies with A.P.I. requirements of completely draining sample line before taking sample.

This Slough pipe-line sampler consists of two units, the control cabinet and the valve cabinet, which can be mounted at location from which samples are desired. Numerous installations of this unit over the past 4 years have proved the trouble-free performance obtained due to minimum number of parts.

Nelson Electric Manufacturing Co., 17 North Detroit, Tulsa, will supply detailed information and installation diagrams of both of these pipe-line samplers on request.

## New Metal-Enclosed Assemblies of Gang-Operated Oil Fuse Cutouts

A new metal-enclosed assembly of gang-operated oil fuse cutouts for economical short-circuit protection and switching has been announced by General Electric Co., Schenectady, N. Y.

The new cutout assemblies permit totally metal-enclosed installations, either single or three-phase. They save installatioon labor because each unit is factory assembled with flexible, insulated cable leads ready for connection to either single or multiconductor cable. The leads enter the individual cutouts above the oil level, thus preventing loss of oil. Switching requires merely throwing a lever 90°. Fuse carriers can be removed without disturbing the gang-operating mechanism.

The new assemblies are particularly well adapted for use (indoor or outdoor) in industrial plants for branch circuits, individual transformers or banks, motors, control apparatus, and electric-heating and other equipment.

The new assemblies can be supplied for wall or direct-to-apparatus mounting, with openings for conduit, cable, or pothead connections.

## TRADE LITERATURE

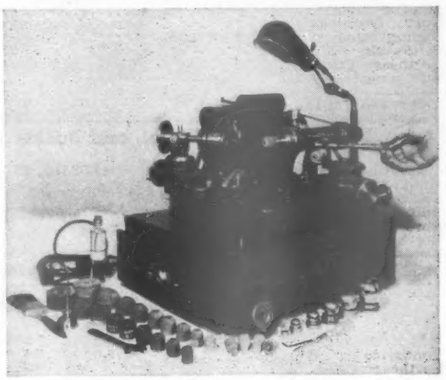
LENAPE HYDRAULIC PRESSING & FORGING CO., Lenape, Pa.—Spirally bound catalog No. 8-42 of the company's line of welding necks, nozzles, elliptical handholes and manholes, forged specialties. Several pages of reference data are included.

INTERNATIONAL NICKEL CO., INC., 67 Wall Street, New York, N. Y.—A 16-page booklet from data prepared by the Development and Research Division of International Nickel Co., includes information in formulas for determining heat transfer rates, the various factors influencing heat transfer through metallic walls, and the thermal conductivities of metals and alloys commonly used in the construction of process equipment.

*Roy F. Parkhill and son Joe, shown with one of his stringing trucks on War Emergency pipe-line job. This K-5 International truck is handling three joints of the 24-in. 40-ft. or longer pipe, which weighs 94.62 lb. per foot*

## Announce Service to Recondition Ball and Seat Valves

The Ball Valve Seat Grinder Co., 102 Jamesville Road, De Witt, N. Y., announce a service of reconditioning ball and seat valves. The machine used is



illustrated and was formerly sold outright to oil companies in domestic and foreign fields. According to the company, a valve seat can be reconditioned several times. New balls are supplied when necessary, otherwise the old ball is used with a reground seat. Old balls are tested for pits and for roundness. All reconditioning work is done at the plant at De Witt, N. Y.

## Monsanto Awarded Army-Navy Joint-Award Burgee

The highest industrial award within the granting of the Army and Navy for achievement in the production of essential war materials was given to Monsanto Chemical Co. recently in three military-naval ceremonies held simultaneously at the executive headquarters of the company in St. Louis, and at the plants in Monsanto, Tenn., and Anniston, Ala.

In St. Louis, Col. Merle H. Davis, commanding officer of the St. Louis Ordnance district, and Commander F. E. Deam, naval material inspector in the St. Louis naval procurement district, as representatives of Secretary of War Henry L. Stimpson and Secretary of the Navy Frank Knox, presented to Edgar M. Queeny, president of Monsanto, the colorful Army-Navy joint-award burgee carrying the "E" for "excellence in production of vital war materials."

## New Tool Bit Cuts Hard, Tough Metals

A new line of tool bits for machining hard, tough steels and the copper or aluminum alloys, recently has been made available by Black Drill Co., Cleveland.

"Hardsteel" tool bits fit admirably into the present war production program wherever lathes, boring mills, shapers and planers with tool lifters work on hard or tough steels, such as the 4100 series, the high-chrome, high-nickel and high-speed tool steels. They are especially suited to work on heavy forgings where deep rough cuts can be made at faster cutting speeds, but at the same time give excellent results when used as finishing or forming tools.

Since they are solid "Hardsteel" they can be reground on an ordinary wheel time after time. But because they take abuse and operate efficiently at red heat, they need less frequent regrinding.

The bits are made square and round from ⅛ in. up in all the usual sizes.

## New Crash Trucks Guard Willow Run

A new-type all-purpose fire truck has been produced by Walter Kidde & Co. to guard hangars and test fields at the new Ford Willow Run bomber plant. Equipped with carbon dioxide, foam and water, the new truck is able to cope with any kind of blaze from

ordinary rubbish fires to those taking place in oil, gasoline, flammable paints, and electrical equipment.

Extinguishing apparatus on these crash trucks include ten 100-lb. cylinders of carbon dioxide under pressure to 850 lb. per sq. in. at 76°, a 200 g.p.m. water pump with suction hoses for use with outside supply and self-contained water tank holding 250 gal.; and a foam generator and twelve 50-lb. pails of foam powder. The carbon dioxide cylinders are connected to a 150-ft. hose mounted on a trunion-type wheel and equipped with horn, nozzle, and shut-off valve assembly.

The water pump is driven from the truck transmission and is equipped with 400 ft. of hose in 50-ft. lengths. The foam generator is mounted on the running board and connected to the pump with a flexible swivel connection permitting operation on or removed from the truck. Additional equipment includes two portable carbon dioxide units, two antifreeze units, axes, crow bars, wrecking bars, searchlights, and extension ladders.

The trucks are built on a Marmon-Herrington chassis with four-wheel drive and powered with a Ford V-8 engine.

## Babcock & Wilcox Receives Maritime "M" Award

Rear Admiral Emory S. Land, chairman of the U. S. Maritime Commission, also administrator of the U. S. War Shipping Administration, recently awarded the Maritime Commission "M" burgee to the Barberton Works of Babcock & Wilcox Co., 85 Liberty Street, New York, N. Y. The award represents the commission's recognition of outstanding achievement.

The "M" burgee now flies alongside the Navy "E" burgee, which was awarded to Babcock & Wilcox on May 11, 1942.

## Second Award of "E" To Foster Wheeler

For the second time Foster Wheeler shops were awarded the "E" for Excellence in Production, thus making it 100 per cent for the company; both the Carteret, N. J., and Dansville, N. Y., plants have now received this highest honor. The All Navy "E" was conferred upon the Carteret Works on May 12 and the new Army-Navy "E" was awarded to the Dansville shops on August 17.

This presentation was one of the first of the new Army-Navy recognitions and the new burgee designed by Rear Admiral Clark H. Woodward, chief of the Incentive Division, whose headquarters are at Washington, was presented by him personally. The pennant was accepted by David McCulloch, executive vice president of Foster Wheeler, who has been closely associated with the Dansville plant for about 40 years.

The ceremony took place in a large airplane hangar of the Dansville municipal airport. Among those present, in addition to Rear Admiral Woodward, the Navy was represented by Capt. C. A. Bonvillian, Capt. B. H. Bruce, Lt. Comdr. A. A. Paulsen, Lt. Comdr. W. S. Downs, Lt. John L. Stone, Lt. J. D. Gessford, Jr., Lt. T. W. Dewart and the Army by Lieutenant Colonel Ogran and Maj. H. R. Battley of the Air Corps. The Foster Wheeler officials included Pell W. Foster, the original Foster of Foster Wheeler, who organized the Dansville Works as the Power Specialty Co. 40 years ago and is still a director of the company; also H. B. Brown, president; John Primrose, vice chairman of the board; David McCulloch, executive vice president; J. J. Nelis, vice president; W. L. Martwick, vice president; George B. Ferrier, vice president; William Lonsdale, vice president; and George Macnoe, president of Foster Wheeler, Ltd.

## Celebrate Plant Expansion and Reception of Minute-Man Flag

Celebrating its second major plant expansion since January 1, along with 100 per cent subscription in war bonds, Cooper-Bessemer Corp. staged a housewarming party for its employes and guests at its headquarters plant at Mount Vernon, Ohio, August 29.

In recognition of the company's efforts in the bond subscription, Gov. John W. Bricker of Ohio presented Gordon Lefebvre, Cooper-Bessemer general manager, with the coveted Minute-Man Flag of the U. S. Treasury. Pres. B. B. Williams, in introducing Governor Bricker, announced that employes have now pledged 11 per cent of their total monthly payroll deduction plan. Thus, Cooper-Bessemer becomes one of the few Ohio industrial concerns of its size to win the Treasury Department's flag.

The party was staged in the new $300,000 addition to the corporation's foundry at Mount Vernon, which had just been completed by Defense Plant Corp. to make room for Cooper-Bessemer's expanding production of castings for large compressors and engines used in the nation's war effort.

Early this year, the 109-year-old corporation completed a large addition to its Pennsylvania diesel-engine plant.

The new foundry addition, which will house the coremaking department of the plant at Mount Vernon, has a floor space 120 ft. wide and 140 ft. long. It contains seven core ovens, four of these built large enough to dry cores for huge castings, some of which go into compressors weighing as much as 110,000 lb.

# AMONG EQUIPMENT MEN

## Callahan Named Goodrich Western District Manager

J. T. Callahan, with B. F. Goodrich Co. since 1928, has been named western district manager of the company's national sales and service division with headquarters in Chicago, Ill.

The new Goodrich sales official succeeds Walter W. Thomen, western district manager since 1939, who has been called to active duty as a major in the office of chief of ordance, War Department. Major Thomen reported for duty August 11.

Mr. Callahan joined Goodrich in Oklahoma City, Okla., and served in sales capacities in Dallas, Tex., and New Orleans, La., before being transferred to Akron, Ohio, in 1938. Until his new appointment, he had been engaged in special work in the company's production of war products.

## Kishbaugh Goes to WPB

T. L. Kishbaugh, vice president of Earle M. Jorgensen Co., steel distributors operating warehouses in Houston, Los Angeles and Oakland, has accepted an appointment as a dollar-a-year man with the War Production Board in Washington, where he will serve in an advisory capacity as an alloy-steel specialist to J. R. Stuart, head of the warehouse unit, iron and steel branch.

Mr. Kishbaugh is a resident of Pasadena, Calif., and has been with Earle M. Jorgensen Co. 12 years. Upon completing an engineering course at Lafayette College at Easton, Pa., he entered the services of Bethlehem Steel Co., and after taking its well-known loop course was transferred to its Johnstown, Pa., plant where he served as superintendent's inspector and rolling-mill foreman for several years before becoming associated with the Jorgensen company in 1930.

His selection for the Washington post by Mr. Stuart is regarded in steel circles not only as recognition of the prominent position held by Gulf and Pacific Coast industry, but also as an indication that the iron and steel branch of the War Production Board is being staffed with men of thorough training and wide practical experience.

## Grancell Moves Into New Los Angeles Factory

I. H. Grancell, manufacturer of joint sealing compounds, moved into a new factory at 1601 East Nadeau Street, Los Angeles, Calif., on September 1. Floor space of the new plant is four times greater which

*I. H. GRANCELL*

*SHERMAN GRANCELL*

with additional manufacturing equipment and increased personnel, considerably increases the firm's capacity.

I. H. Grancell has been a leading figure in the oil industry for many years. He came from the East as a young man and since about 1915 has conducted his own business manufacturing various lead products. Associated with him have been two sons, Alvin, now in the U. S. Army, and Sherman, now general manager of the company.

The main products of the firm are Bestolife lead seal joint sealing compounds used in the oil and refining industries to prevent galling of tool joints, drill collars and subs, lengthen life of threads, increase packing life and prevent scoring; to assure tightest joints, yet quick and easy separation of parts; to prevent galling of pipe threads, etc. Another produce, Bestolife lead seal "oxygen grade" compound, is manufactured for use on oxygen tank fittings and instruments.

A modern laboratory is being constructed at the new plant, and the Grancell organization offers the facilities of this laboratory and its personnel to the oil and refining industries for joint sealing and lubrication problems.

## Gibbons Appointed Representative For Wales Dove-Hermiston

*J. E. B. GIBBONS*

J. E. B. Gibbons has been appointed special representative to the oil and gas industry for Wailes Dove-Hermiston Corp., according to an announcement by W. H. T. Thornhill, vice president. Mr. Gibbsons was formerly associated with the Dresser Manufacturing Co. and Victaulic Co. of America.

## Worthington Appoints R. J. Laidlaw Manager of Cleveland Office

Worthington Pump & Machinery Corp. announces the appointment of R. J. Laidlaw to the position of manager of its Cleveland, Ohio, district office. Mr. Laidlaw will succeed A. J. Klug who will now devote his entire time to special work with certain important industries in the Cleveland district.

Mr. Laidlaw has been connected with the Worthington organization in various capacities since his return from overseas in 1919 from active service with the 32nd Division in World War 1.

# CLASSIFIED ADVERTISING

## Patent Attorneys

**PATENTS — TRADE MARKS**

*All cases submitted given personal attention.*

Form "Evidence of Conception" with instructions for use and "Schedule of Government and Attorney's Fees—FREE.

**LANCASTER, ALLWINE & ROMMEL**
Patent Law Offices
**418 Bowen Bldg., Washington, D. C.**

## Leases and Drilling Blocks

LEASES—East Texas, La., South Ark. 20 acres up, dollar acre up.—Owners—Address Attorney, Box 1122, Little Rock, Ark.

**LEASES ROYALTIES**

**PRODUCING OR NONPRODUCING**

**Texas, New Mexico, Oklahoma, Louisiana and Illinois**

**20 Years' Experience**

**Inquiries Invited**

**B. D. BUCKLEY**

**Paul Brown Bldg., St. Louis, Mo.**

FOR SALE: Oil and Gas leases on proven structures, drilling propositions, small production and fluorspar deposits. Reports furnished. W. P. Harley, Bowling Green, Ky.

I HAVE production on a large block of leases and I need capital to properly develop and market. Will make responsible party a very attractive proposition under certain circumstances. The Oil and Gas Journal, Box B-232, Tulsa, Okla.

FLORIDA Oil Leases for sale—Jackson, Holmes, Washington counties. Spreads of 1000 acres; 25 cents per acre; 10-year leases; 10-cent rental. Paid up to 1943. Why wouldn't the Gulf Coast oil trends extend across Florida? Write for further information, 600 Gulf States Bldg., Dallas, Texas.

FEW small tract considered on structure near 9,000 ft. East Texas Wildcat starting. Closing out 25 for one bets short time. E. Croft, Proctor, Texas.

FOR SALE

40 Acre Lease in Dupo, Ill. One well made over 75 barrels per day in Trenton. Will sell cheap. Box B-272, The Oil and Gas Journal, Tulsa, Okla.

CONGRESS has opened U. S. Oil reservation for oil lease by American citizens. Want to arrange filings to cover good structural area. Development arranging. Small expense, big opportunity. Write Box B-274, The Oil and Gas Journal, Tulsa, Okla.

NOTICE OF SALE OF
OIL WELLS AND LEASES

The Ordovician Oil Company, of San Angelo, Texas, offers the following properties for sale to the highest cash bidder:

7 Producing Oil Wells and a half interest in two other producing wells located in what is known as the Sharon Ridge field, in Scurry County, Texas, and the oil and gas leases on which they are located, aggregating around 280 acres.

1 Well contracted to be drilled on 40 acres proven acreage, and another well to be tested following a shot, which shows evidence of production.

1—61 Wichita Spudder, good condition, together with power, lights, equipment and tools.

3 New 250 Barrel welded storage tanks.

The above wells are now producing under proration and shut-down days around 2000 barrels per month, which sells for around 92 cents to 94 cents per barrel.

Detailed particulars relating to all these items will be furnished on request, including valuation reports of responsible and reliable petroleum engineers.

If interested write the Ordovician Oil Company. Bids will be received at its office, Box 49, San Angelo, Texas, up to the 15th day of October, 1942.

## Leases and Drilling Blocks

RECEIVERSHIP SALE: 80 a. lease, McPherson Co., Kans., one well, cased with 10", 6"; tubing, rods, pump, engine, 3 tanks, boiler, etc. Information Lee Smith, Hoisington, Kans.

FOR SALE: Oil and gas leases North and South Dakota, reasonably priced. Owner, P. O. Box 1163, Tulsa, Oklahoma.

FOR LEASE: 160 Acres in Oil King Dist., Fresno Co. Near big development, registered dealers only. Wm. L. Crews, 200 Shaver St., San Rafael, Calif.

BARTLESVILLE Sand lease, 280 acres, 20 to 50' pay. Excellent water drive proposition, 3 successful ones vicinity; 4 wells on lease. Cash, over-ride, or working interest considered. Box B-281, The Oil and Gas Journal, Tulsa, Okla.

TO LEASE: The best Petroleum lands of CUBA according to Government Geologists. 1000 acres. Come and see them. Gustavo Roig, Capdevila 57, Habana, Cuba.

## Ranches and Farm Lands

14,000 ACRES ranch, Oklahoma. Is handling 700 cattle. In estate, must sell or will lease for oil or sell lease and royalty. Adjoins block of Major Oil Co. Write for description, Guy Speakman, Liberal, Kans.

FOR SALE BY OWNER

8-section grass pasture and 280 acres of irrigated farm land 10 miles south of Roswell and ¼ mi. of main highway. W. H. Woodman, 806 N. Penn, Roswell, N. M.

BEST 1800 acres Central Texas, sheep proof, fine grass, wonderful springs, GOOD improvements, light, gas, SCENIC and Good. $20. Carver, 1709 San Antonio, Austin, Texas.

## Money Raising

WANTED: $7500 in escrow for half interest in 1000 acres leases and well to be drilled through 1500 to 2000 feet Strawn sand, West Texas. No money paid until well drilled. Address 1122 Kirby Bldg., Dallas, Texas.

## Situations Wanted

ENGINEER: Experienced plant layouts, mechanical and structural design of high pressure processing and boiler plants and equipment; recently assisted in development and supervised design of large gasoline storage and distribution system using and reclaiming $CO_2$ blanket without compressors; age 46; salary $6,000. Box B-260, The Oil and Gas Journal, Tulsa, Okla.

ENGINEER, experienced in design, construction, operation, and maintenance of modern refinery equipment. Age 42, draft exempt. Permanence desirable. Write Box B-284, The Oil and Gas Journal, Tulsa, Okla.

12 years practical experience, gauging, pipelining, and refining. Complete lease and royalty knowledge. Proven executive ability, competent in office, will work in office or field. Desire permanent connection, prefer Oklahoma. Draft status 3-A. Available about October 20th. Write Box B-283, The Oil and Gas Journal, Tulsa, Okla.

PRODUCTION OR FIELD SUPERINTENDENT: High class practical man. Twenty years experience. Box B-286, The Oil and Gas Journal, Tulsa, Okla.

## Help Wanted

NOTICE TO ADVERTISERS

Advertisers offering positions to workers skilled in critical war industries are requested by the War Manpower Commission to include the following sentence in their advertisement:

"Applications from those now employed in war industries will not be considered."

ENGINEERS WANTED

Chemical or Mechanical with minimum one year oil refinery plant operation or maintenance experience. Require University Engineering School graduate with basic knowledge principles fluid flow. To work on process flow sheets, equipment selection and general handling oil refinery. Defense Contracts as assistant to senior engineers. No aliens or men engaged Defense work considered. Opportunity up to individual. In reply state experience, education, draft status, salary expected. Foster Wheeler Corporation, Room 2402, 165 Broadway, New York.

WANTED—By large organization, man or woman familiar with leading companies in oil and gas industry, and able to undertake analytical work. Must be able to write clearly and concisely for publication. Reply should outline applicant's age, education, experience, number dependents, and salary desired. Box B-282, The Oil and Gas Journal, Tulsa, Okla.

OKLAHOMA refinery, rebuilding latest design plant making aviation gasoline, desires process engineer, refinery accountant, purchasing agent, traffic manager, chemist. Write complete history, education, experience, salary desired. Our employees know of this advertisement. Box B-280, The Oil and Gas Journal, Tulsa, Okla.

## Legal Blanks

BURKHART'S legal blanks and general forms serving Mid-Cont. oil field since 1908—Okla. Kans. N. Mex. Tex. Ala. Ark Fla. Ga. Ill. Ind. Ky. La. Mich. Miss. Mo. Neb. N. Dak. Tenn. Wyo. Free catalog samples on request. Burkhart Ptg. & Sta Co., 115 S. Cinn., Tulsa, Oklahoma

## Financing

CAPITAL SEEKERS — Interested in raising $25,000 or more for a legitimate project should communicate with AMSTER LEONARD, Fox Theater Bldg., Detroit, Mich.

## For Sale—Instruments

FOR SALE

10 Crosby 5000#, 6" steel tube gages @ $21.00
4 Ashcroft 3000#, 5" steel tube gages @ $20.00

INSTRUMENTS INCORPORATED
6725 Snider Plaza, Dallas, Texas

FOR SALE

1 Foxboro, 100" flow control, less mercury, $190.00, F.O.B. Dallas.

INSTRUMENTS INCORPORATED
6725 Snider Plaza, Dallas, Texas

## Business Opportunities

WANT a drilling proposition. Large Indiana acreage. Good structure. Jesse Allen, 1819 Garfield Ave., Terre Haute, Ind.

## Royalties

ANDREW J. BARRETT
The Philtower
Tulsa, Oklahoma.

WE BUY & SELL all types of Oil and Gas Royalties. Sales restricted to registered dealers only. Grimes Royalty Co., National Mutual Bldg., Tulsa, Okla.

OIL PRODUCERS urgently need these 2-U.S. and 1 Canad. Patents for the Extraction of Oil from exhausted formation of Petroleum and Oil bearing sands, for sale or in royalty by Leo Strandell, Lometa, Calif.

FOR SALE: Landowner's Royalty under 120 acres leased to Humble Oil & Ref. Co. in Lea Co., N. M. North of the Big Hobbs Pool. 27 pools in County, HARRY S. WRIGHT, FARMINGTON, N. M.

## Incorporation

DELAWARE CHARTERS: Complete service $35. Submitted forms. Chas. G. Guyer, Inc., Wilmington, Delaware.

## Oil Industry Printing

OIL FIELD LEGAL BLANKS

Leases, assignments, releases, township plat books, well records, etc. Request on your letterhead gets free catalog. Olds Press, 215 East Third St., Tulsa, Okla.

## Equipment Wanted

WANTED—Steel tanks total 120,000 gallon capacity. Will take 5000 gallon or larger. Tidewater Equipment & Machinery Corp., 305 Madison Ave., New York, N. Y.

**WANTED TO BUY**

Pipe of all sizes, 2" to 16", inclusive, also refineries, pipe lines and abandoned wells. Wire, write or phone

**Louisiana Iron & Supply Co.**
**Shreveport, La.**

FIFTY 5" OD x 25' long Hot Drawn Seamless Tubing with an average wall thickness of either ¼", ⅜" or ½". Pan American Petroleum Corp., Destrehan, La.

WANTED: 64,000 ft. of 6 inch seamless high pressure line pipe or can use drill pipe. State location and price. Will buy in small lots. Melton Machinery & Supply Co., Seminole, Okla.

WANTED

Abandoned *Pipe Lines*, in or out of the ground, *Oil Wells, Steel Buildings* and Steel Storage *Tanks* of all sizes.

**JOS. GREENSPON'S SON PIPE CORP.**
**National Stock Yards, St. Clair Co., Illinois.**

WANTED: 3000' of full-hole 2½" or 2⅞" drill pipe.

TO SELL: 3 standard pump rigs, includes 25 HP gas engines, steel derricks, low price.

A. W. ADKISSON
2018 W. T. Waggoner Bldg.,
Ft. Worth, Texas

SEVERAL #40 gallon Foam Outdoor Type Mounted Fire Extinguishers. Wire Ben B. Bodne Oil Co., Charleston, S. C.

HP gas separator. Prefer one with pilot control, size 24" or 30" x 11", 1000 P test, 500 WKP. Foster Dev. Co., 612 N. First Street, Seminole, Okla., Phone 329.

## For Sale—Equipment

TWO vertical type Askania Magnetometers. Also one complete Heiland resistivity outfit. Write Box B-285, The Oil and Gas Journal, Tulsa, Okla.

3200' 2½" upset, 8 round thread used tubing. Would make oil or water line, 12c per ft. 1—#30 Star drilling machine, walking beam type, $500.00. 1—#2A National drilling machine, fair mast, $500.00. 1—11 x 12 steam drilling engine, 800', 8¼" 24# casing. Numerous drilling equipment including bits and stems. Foster Dev. Co., 612 N. First, Seminole, Okla., Phone 329.

**Classified advertising rates: First insertion, 35 cents a line; each additional insertion, 25 cents a line, PAYABLE IN ADVANCE. Six words usually make a line. Count as a word each one-letter word and each group of figures. White-space computed at regular line rate. Allow two extra lines for blind ads. Ads of less than three lines not accepted. No formal acknowledgment is made, and proofs cannot be shown in advance of publication.**

| | 1 time | 2 times | 3 times | 4 times |
|---|---|---|---|---|
| 3 Lines | $1.05 | $1.80 | $2.55 | $3.30 |
| 4 Lines | 1.40 | 2.40 | 3.40 | 4.40 |
| 5 Lines | 1.75 | 3.00 | 4.25 | 5.50 |
| 6 Lines | 2.10 | 3.60 | 5.10 | 6.60 |
| 7 Lines | $2.45 | $4.20 | $5.95 | $7.70 |
| 8 Lines | 2.80 | 4.80 | 6.80 | 8.80 |
| 9 Lines | 3.15 | 5.40 | 7.65 | 9.90 |
| 10 Lines | 3.50 | 6.00 | 8.50 | 11.00 |

**Classified Display is set with a border and may be used in one or two column sizes.**

| | | |
|---|---|---|
| 1 Inch | 1 time | $5.00 |
| 1 Inch | 13 times | 4.50 per inch |
| 1 Inch | 26 times | 4.00 per inch |
| 1 Inch | 52 times | 3.50 per inch |

**This space may be contracted for over a period of one year from the date of the first insertion and is PAYABLE IN ADVANCE, MONTHLY.**

**THE OIL AND GAS JOURNAL**
**Tulsa, Oklahoma**